



ONR GUIDE			
THE IONISING RADIATIONS REGULATIONS 1999			
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1. INTRODUCTION

- 1.1. Many of the licence conditions attached to the standard nuclear site licence require that licensees should make arrangements to comply with regulatory obligations under the conditions. ONR inspects compliance with licence conditions, and also with the arrangements made under them, to judge the suitability of the arrangements made and the adequacy of their implementation. ONR also inspects compliance with The Ionising Radiations Regulations 1999, (IRR99). To support inspectors undertaking compliance inspection, ONR produces a suite of guides to assist inspectors to make regulatory judgements and decisions in relation to the adequacy of compliance, and the safety of activities on the site. This inspection guide is one of the suite of documents provided by ONR for this purpose.
- 1.2. It should be noted that in 2017 IRR99 will be replaced with the Ionising Radiations Regulations 2017 and this document and other ONR guidance will be updated in line with the new regulations.

2. PURPOSE AND SCOPE

- 2.1 This guide has been prepared as an aid to inspection activities carried out by ONR nuclear safety inspectors at sites, in judging the licensee's compliance with the requirements of IRR99. This guidance provides a framework for these inspection activities, within which the nuclear safety inspector is expected to exercise their discretion. This framework is provided to facilitate a consistent approach to compliance inspection of IRR99.
- 2.2 The guidance is for use by all nuclear safety inspectors in ONR. The guidance does not indicate when or to what extent inspections of the requirements of IRR99 should be carried out, as these matters are covered in individual inspector's inspection plans, which take account of priorities established by the relevant ONR Division.
- 2.3 It is not anticipated that all the topics recommended for consideration by the site nuclear safety inspector will be covered in a single inspection. Some aspects (e.g. documentary information) need not necessarily be inspected on site.
- 2.4 It is important to note that IRR99 apply to a range of practices and work with ionising radiation undertaken at any site, whether it is a nuclear licensed site or not. ONR has regulatory responsibility for IRR99 at GB Nuclear sites, authorised defenced sites and practices (e.g. HM Naval Base Clyde, nuclear warship sites and new nuclear build sites. It should be noted HSE has vires outside of these sites, not ONR.
- 2.5 In Section 6, a distinction is made between those topics which are likely to be suitable for planned compliance inspection by the site nuclear safety inspector, and those which may be suitable for referral to a specialist ONR radiological protection inspector. However, any topic may be referred to a specialist inspector at the discretion of the site nuclear safety inspector.
- 2.6 Site nuclear safety inspectors should note that aspects of IRR99 compliance can also be included in planned compliance inspection against Licence Conditions (e.g. LC 8 - Warning Notices; LC 10 - Training; LC 11 - Emergency Arrangements; LC 12 - DAPs and SQEPs; LC 25 - Operational records, LC 26 - Control and supervision of operations and LC 28 – Examination, Inspection, Maintenance and Testing).

3. THE IONISING RADIATIONS REGULATIONS 1999

- 3.1 IRR99 are set out, together with the Approved Code of Practice (ACoP) and Guidance, in the HSE document "Work with Ionising Radiation, Ionising Radiations Regulations 1999, APPROVED CODE OF PRACTICE AND GUIDANCE" – L121 - ISBN 97807

17617 463, www.hse.gov.uk/pubns/books/l121.htm. Nuclear safety inspectors should consult this document in preparing for and carrying out their compliance inspection.

4. PURPOSE OF THE IONISING RADIATIONS REGULATIONS 1999

- 4.1 IRR99 require that radiation exposures to workers and members of the public are restricted so far as is reasonably practicable. This is achieved by placing duties on employers to protect employees and other persons against ionising radiation, arising from work with radioactive substances and other sources of ionising radiation, and by placing certain duties on employees.

5. GUIDANCE ON ARRANGEMENTS FOR THE IONISING RADIATIONS REGULATIONS 1999

- 5.1 The duty holder should have arrangements in place to demonstrate compliance with IRR99. The following list considers aspects of the requirements. The list is neither exclusive nor exhaustive and will be subject to review and revision in the light of operational experience. If duty holders have generic models for arrangements then it is for the site to justify any deviation from the models.
- 5.2 Procedures shall address the requirements of IRR99. The person responsible for compliance should be identified.
- 5.3 Procedures should be readily available and should be up to date, signed by an appropriate person and be controlled documents under a system compliant with the requirements of LC 17 – Management Systems.
- 5.4 Brief guidance is given below for each of the seven parts of IRR99.

Part I (Interpretation and General - Regulations 1 - 4)

- 5.5 This defines the terms used in and the scope of the Regulations. For the purposes of the Regulations, an employer includes a self-employed person and an employee includes a self-employed person and a trainee.

Part II (General principles and procedures - Regulations 5 -12)

- 5.6 The Regulations:
1. prohibit the carrying out of specified practices without the authorisation of the appropriate authority (ONR or HSE);
 2. require specified work with ionising radiation to be notified to the appropriate authority (ONR or HSE);
 3. require Radiation Employers to make a prior assessment of the risks arising from their work with ionising radiation, to make an assessment of the hazards likely to arise from that work and to prevent and limit the consequences of identifiable radiation accidents;
 4. require Radiation Employers to take all necessary steps to restrict, so far as is reasonably practicable, the extent to which employees and other persons are exposed to ionising radiation;
 5. require respiratory protective equipment used in work with ionising radiation to conform with agreed standards and require all personal protective equipment and other controls to be regularly examined and properly maintained;

6. impose limits (specified in Schedule 4) on the doses of ionising radiation which employees and other persons may receive;
7. require in certain circumstances the preparation of contingency plans for radiation accidents which are reasonably foreseeable.

Part III (Arrangements for the Management of Radiation Protection - Regulations 13 -15)

- 5.7 The Regulations require that Radiation Employers consult suitable Radiation Protection Advisers for the purpose of advising the Radiation Employer as to the observance of the Regulations and shall consult the RPA in respect of matters specified in Schedule 5. Radiation Employers shall ensure that adequate information, instruction and training are given to employees and other persons. Radiation Employers are required to co-operate by exchanging information, to enable compliance by others with requirements to limit the exposure of employees to ionising radiation.

Part IV (Designated areas - Regulations 16-19)

- 5.8 The Regulations require that areas in which persons need to follow special procedures to restrict exposure, or in which persons are likely to receive more than specified doses of ionising radiation, be designated as controlled or supervised areas, and that suitable arrangements are in place.

Part V (Classification and monitoring of persons - Regulations 20-26)

- 5.9 The Regulations require that:
1. employees who are likely to receive more than specified doses of ionising radiation be designated as classified persons;
 2. doses received by classified persons are assessed by one or more Dosimetry Services formally approved by HSE, i.e. an Approved Dosimetry Service, (ADS). (Sometimes licensees use different ADS services for different aspects of dosimetry, such as for external whole body radiation and for the separate assessment of internal radiation dosimetry. Similarly, a record keeping ADS must be appointed, recognising that the dose assessing ADS is not necessarily the same as the record keeping ADS);
 3. records of such doses are made and kept for each such person. The Regulations also include requirements for medical surveillance and investigation, notification and dose limitation in the event of overexposures.

Part VI Arrangements for the Control of Radioactive Substances, Articles and Equipment - Regulations 27-33)

- 5.10 The Regulations:
1. require that where a radioactive substance is to be used as a source of ionising radiation, it should, whenever reasonably practicable, be in the form of a sealed source;
 2. require any articles embodying or containing radioactive substances to be suitably designed, constructed, maintained and tested;

3. cover the accounting for, keeping and moving of radioactive substances and require that incidents in which more than specified quantities of radioactive substances are released or are lost or stolen be notified to HSE;
4. impose duties on manufacturers, etc. and installers of articles for use in work with ionising radiation to ensure that such articles are designed, constructed and installed so as to restrict, so far as is reasonably practicable, exposure to ionising radiation;
5. impose similar duties upon employers in relation to equipment used for medical exposures, together with additional duties in relation to the testing and safe operation of such equipment;
6. require employers to investigate any defect in medical equipment, which may have resulted in a person receiving a dose of ionising radiation much greater than was intended and to notify HSE of such incidents;
7. prohibit interference with sources of ionising radiation.

Part VII (Duties of employees and miscellaneous - Regulations 34-41)

5.11 The Regulations impose duties upon employees engaged in carrying out work with ionising radiation and also:

1. provide for the approval of dosimetry services by HSE;
2. provide for a defence on contravention of certain regulations;
3. provide for exemptions to be granted by HSE;
4. extend the provision of the Regulations outside Great Britain;
5. contain transitional provisions; and
6. introduce modifications relating to the Ministry of Defence

6. GUIDANCE ON INSPECTION OF ARRANGEMENTS AND THEIR IMPLEMENTATION

- 6.1 Part 6 of this guidance is to assist nuclear safety inspectors in judging the adequacy of the duty holder's arrangements. The following list is neither exclusive nor exhaustive and will be subject to review and revision in the light of operational experience. It does, however, provide a list of aspects of IRR99 that can be examined during routine inspections.
- 6.2 Check that adequate arrangements are in place and procedures have been made to demonstrate compliance with IRR99. Check that these arrangements are implemented on the site.
- 6.3 Examine the procedures documentation layout and check that it is consistent. Review the procedures to establish validity, whether any changes have been made since the last review and whether the identified responsible persons are correct. Note whether instructions, methods and quality assurance requirements claimed in procedures have been followed and whether any changes that have been made have been correctly incorporated and validated.
- 6.4 Radiation Employers, including nuclear site licensees, should be able to refer to documentation showing how they discharge their duties under IRR99 including:

- Prior Risk Assessment (Reg 7)
 - Restriction of Exposure SFAIRP (Reg 8)
 - Provision of PPE (Reg 9)
 - Contingency Plans (Reg 12)
 - Appointment of a Radiation Protection Adviser (Reg 13)
 - Local Rules and Appointment of Radiation Protection Supervisors (Reg 17)
 - Arrangements with one or more Approved Dosimetry Service (ADS) for dose assessment and recording (Reg 21)
 - Arrangements for medical surveillance of classified persons (Reg 24)
 - Control of radioactive substances (Regs 27 - 29)
 - Investigations and Notifications (Regs 25 & 30)
- 6.5 Duty holders often refer to a compliance matrix, which sets out the procedures and documents that secure compliance with each Regulation, together with the person responsible. Such a matrix is likely to be similar to that for compliance with nuclear site licence conditions.
- 6.6 Duty holder's arrangements are often set out in generic rules (e.g. "Radiological Safety Rules") that are intended to deliver compliance with IRR99. These are sometimes produced by the licensee centrally, and implemented at each site via lower tier procedures and instructions. Nuclear safety inspectors should seek to ensure that such documents are included in arrangements for document control and are regularly reviewed to reflect the requirements of IRR99.
- 6.7 It is for inspectors to apply their experience and discretion to determine the extent and depth of a particular inspection, taking due account of a number of factors such as safety significance, complexity and technical specialism.
- 6.8 Guidance is given here on some of the key requirements. In deciding which relevant arrangements to sample, inspectors should consider reported information, events or previous enforcement action taken on the site or at other sites, and the findings of related licence compliance inspections (e.g. LC 8 - Warning Notices; LC 11 - Emergency Arrangements; LC 12 - DAPs and SQEPs; LC 28 – Examination, Inspection, Maintenance and Testing).
- 6.9 A distinction is made between those topics which are likely to be suitable for planned compliance inspection by the site nuclear safety inspector, and those which may be more suitable for referral to a specialist radiological protection inspector. However, any topic may be referred to a specialist radiological protection inspector, at the discretion of the site nuclear safety inspector.
- 6.10 A range of HSE guidance on specific aspects of IRR99 is readily available (e.g. via the HSE website). This is listed at [Appendix 1](#). Site inspectors should be aware of and follow this guidance.
- 6.11 Where site inspection indicates that a licensee's arrangements fall significantly short of IRR99 requirements, and especially where enforcement action appears to be

warranted under the [Enforcement Management Model](#), (EMM) the site nuclear safety inspector should seek advice from an ONR specialist radiological protection inspector.

Topics likely to be suitable for planned compliance inspection

Regulatory Duties

- 6.12 The Regulations draw a distinction between the terms 'Employer' and 'Radiation Employer', the latter being an employer who carries out work with ionising radiation. Hence, there are additional duties on those employers who carry out work with ionising radiation. On a nuclear site there could be employers who are not radiation employers e.g. contractors.
- 6.13 The IRR99 duties on the employer are also imposed on the holder of a nuclear site licence, as far as the work relates to the licensed site (Reg 4 (3)). The licensee will almost certainly be a Radiation Employer, so that the IRR99 duties on the Radiation Employer will also apply to the licensee. ONR have taken the view that the employers under consideration here include contractors and visiting employers to a licensee's site, thereby placing a duty on the licensee to ensure that the work undertaken by these employers is compliant with any relevant duty under the IRR99. However, it is recommended that legal advice is taken on this interpretation, prior to taking any enforcement action under Regulation 4(3) for an alleged breach by a Licensee of an IRR99 duty that, in the first instance, is a duty on a contractor or a visiting employer to its site.
- 6.14 The Licensee (a corporate body) normally appoints individuals to specific posts, defined in their corporate arrangements or in regulations, with specific responsibilities for carrying out the regulatory duties on behalf of the corporate body. At nuclear licensed sites, the duties of the Radiation Employer are normally discharged by the most senior person on the site (Site Director, Station Manager, etc.) delegated as appropriate through the management organisation structure.
- 6.15 Site inspectors should consider holding discussions with Duty Holders - notably Radiation Employers, Nuclear Site Licensees, site operators, Employers (e.g. contractors) and employees, as well as RPAs and RPSs, to ensure that they understand their duties under the Regulations.
- 6.16 Site inspectors should discuss the Licensee's / site operator's own arrangements for regularly auditing compliance with the duties imposed by IRR99.

The Radiation Employer

- 6.17 It is suggested that inspections include an interview with the appropriate person(s) identified in the corporate arrangements to confirm that they accept and understand their regulatory duties and responsibilities under the Regulations.
- 6.18 Copies of appointment letters for Radiation Protection Advisers and Radiation Protection Supervisors should be available and should include the scope of their appointment.
- 6.19 The appropriate person(s) should be able to demonstrate that they have sought advice from a number of sources including their appointed RPA(s), their professional health physicists and the nuclear safety committee.

The Nuclear Site Licensee

- 6.20 Nuclear safety inspectors may choose to confirm that the licensee has adequate arrangements in place to ensure that all duties under IRR99 are discharged in respect

of contractors working on the site. For example, the licensee should have arrangements in place to ensure that contractors working on the site are given adequate instruction, information and training (e.g. via induction training) and for ensuring that contractors are classified, as appropriate, for the purposes of dose assessment and recording.

The Employer

- 6.21 All employers (notably contractors at nuclear sites) have responsibilities under IRR99 for dose investigation (Reg 8 (7)), dose limitation (Reg 11), training, etc. (Reg 14), cooperation between employers (Reg 15) and classification / monitoring (Regs 20 - 24).
- 6.22 Additional duties are placed on those in control of, or who designate, areas ((Regs 16, 18 and 19), and those in control of equipment (Reg 32 (1) to (5)).
- 6.23 Inspectors may consider interviewing contractor's staff, to ensure that adequate arrangements are in place for cooperation with the licensee and for discharge of these responsibilities.

The Employee

- 6.24 Inspectors should be aware that employees have the following duties under IRR99 (Reg 34):
- Avoid unnecessary exposure to themselves and other persons
 - Make proper use and look after PPE
 - Take care of radiation passbook where issued
 - Comply with contingency plans and dose assessment arrangements
 - Comply with medical surveillance arrangements
 - Notify the employer of incidents.

Topics recommended for referral to a specialist radiological protection inspector at the site inspectors discretion

The Radiation Protection Adviser, (RPA), (Reg 13)

- 6.25 On most nuclear sites, the RPA function is provided in-house, typically by one or more members of the radiological protection function on the site. Individuals may be appointed to fulfil only a limited number of RPA responsibilities, with other functions being fulfilled by other appointed individuals (who may or may not be based on the site). All individuals appointed in this way should, between them, cover all the RPA regulatory duties and are sometimes referred to as a "Corporate RPA".
- 6.26 Suitable and sufficient RPAs should be appointed in writing by the Radiation Employer and they should be aware of any limitations on the scope of their written appointment. They should hold a valid certificate from an assessing body (e.g. RPA 2000) or a relevant NVQ.
- 6.27 Frequently an individual appointed as an RPA may have a senior line management role in the organisation, and may also have separate regulatory duties (e.g. as Head of the Approved Dosimetry Service). Inspectors should seek to ensure that such individuals are clear about the scope and delineation of their duties, and that adequate procedures are in place to ensure that an RPA is consulted on those matters set out in schedule 5 of IRR99:

- Implementation of requirements for controlled and supervised areas
 - Installation of new or modified sources of ionising radiation
 - Regular calibration/checking of radiation monitoring equipment
 - Periodic examination of systems to restrict radiation exposure
- 6.28 In addition, ONR would expect the Radiation Employer to consult the RPA on the observance of the Regulations in all areas

The Radiation Protection Supervisor (RPS) (Reg 17)

- 6.29 The RPS should be appointed by the Radiation Employer for the purpose of securing compliance with IRR99 in respect of work carried out in an area subject to Local Rules. Contractors who are radiation employers may appoint one of their own employees or other suitable person (e.g. an employee of the licensee or of the site operator) as an RPS.
- 6.30 Some licensees and site operators appoint staff at team leader level as an RPS, even though they may be based in an area some distance from the area subject to Local Rules. This may be acceptable so long as adequate control is exercised, for example, through permit to work and other safety procedures. If RPSs are appointed at a higher level than the team leader, they still need to be able to ensure that personnel comply with the Local Rules.
- 6.31 Inspectors should consider interviewing one or more RPSs with a view to establishing that they are clear about their appointment, have received adequate training, know and understand the requirements of IRR99 and the relevant Local Rules, and understand the precautions to be taken in an emergency. RPSs should command sufficient authority from people working under their supervision.
- 6.32 In addition to the advice in the ACoP and Guidance, information on good practice is available in HSE Information Sheet Ionising Radiation Protection Series No. 6, which is available on the HSE website

Prior Risk Assessment (Reg 7) and Contingency Plans (Reg 12)

- 6.33 The Radiation Employer should carry out a risk assessment, sufficient to show that all hazards with the potential to cause a radiation accident have been identified and the nature and magnitude of the associated risks have been evaluated. At nuclear licensed sites it is likely that such a risk assessment will identify reasonably foreseeable accident scenarios. These are likely to include, not only the major hazards for which emergency arrangements are in place under licence condition 11, but also other hazards (e.g. those arising from radiography and the use of radioactive solids or solutions that may be spilt in an active laboratory) or chemo toxic hazards, (such as with uranium hexafluoride, where the chemo toxic hazard predominates over the radiological hazard, but both hazards need to be addressed). The Radiation Employer should take steps to prevent such accidents, and following consultation with the RPA, should have prepared a Contingency Plan that seeks to limit the consequences of any such accident.
- 6.34 Contingency Plans should be rehearsed at suitable intervals. People affected by the Contingency Plan should be provided with suitable training, instructions and dosimetry. Some Contingency Plans may be generic (e.g. where operations such as radiography are carried out at different locations at various times). Nuclear safety inspectors should ensure that such plans identify those responsible for taking action, immediate actions for assessing and mitigating the effects of any accident, the location of any PPE that might be needed, personal dosimetry requirements, sources of advice, the circumstances under which the on or off site emergency services should be called, the

need to establish the building and/or site emergency control centre, together with provisions for dose assessment, both in immediate response to and following the accident. Arrangements for the provision of dosimetry to emergency services personnel need to be addressed. The provision of adequate prior information to both the 'on' and 'off' site emergency services should be evident. Emergency requirements developed to comply with the provisions of REPIR should also be considered.

Restriction of Exposure (Reg 8)

- 6.35 The Radiation Employer has overall responsibility to take all necessary steps to restrict, so far as is reasonably practicable, the extent to which his employees and other persons are exposed to ionising radiation. In other words, their exposure must be ALARP. Priority should be given to elimination and then engineering controls, in preference to management controls. Undue weight should not be placed on "time at risk" arguments, dose sharing or PPE.
- 6.36 Enforcement action has been taken where employee exposures were well below the dose limits but were not ALARP and there was a clear potential for significantly greater dose uptake than was actually incurred. Site inspectors should ensure that data is collected and reviewed for the maximum individual radiation doses, rather than just average radiation exposures. The exposures of contractors and others should also be assessed, not just employee doses.
- 6.37 The application of relevant good practices and standards is part of the ALARP justification. Examples of good practice in this area are given in [Appendix 2](#).
- 6.38 Radiation employers are required to utilise dose limits and dose constraints in restricting exposure at the planning stage of radiological protection (e.g. in plant design) and to carry out investigations where an employee receives an effective dose of 15 mSv/year (or any lower effective dose specified by the employer). Site nuclear safety inspectors should consider referring such aspects to a nuclear safety specialist radiological protection inspector.
- 6.39 The requirement for restriction of exposure extends to all persons, including members of the public. As part of their arrangements to demonstrate that effective doses received by members of the public do not exceed dose constraints and dose limits are ALARP, licensees measure radiation dose rates at their site perimeter. ONR annually collects data from licensees on perimeter dose rates and estimates of exposures of the public representative person for direct radiation and makes licensees' dose estimates available for publication in the Radioactivity in Food and the Environment (RIFE) report. Any trends in perimeter radiation dose rates should be assessed and investigations conducted if adverse trends are identified. ONR radiation protection specialist inspectors also carry out interventions at sites to assess the adequacy of licensees' arrangements for assessing and controlling public dose from direct shine. Currently, and as part of a rolling programme, Public Health England, Radiation Metrology Group - a technical support contractor - is contracted by ONR to carry out an independent assessment of annual dose to members of the public and compares their findings to the data reported by the licensee.

Personal Protective Equipment (Regulations 9 & 10)

- 6.40 PPE should bear the CE marking or should have been approved by HSE under the arrangements in place before 30 June 1995. Details are given in the guidance to the PPE at Work Regulations 1992 and in document HSG 53. Site nuclear safety inspectors should ensure that PPE is readily available (in sufficient quantity), in good condition, is appropriately stored, is fit for purpose, and is subject to regular examination and maintenance. The industry is planning to carry out work to refine the assigned protection factors associated with different types of PPE/RPE.

Dose Limits (Reg 11) and Overexposures (Regs 25, 26)

- 6.41 Dose Limits are set out in Schedule 4 Part 1. Any known or suspected overexposure should be investigated as required by Regulation 25. The Radiation Employer should notify ONR as soon as any such overexposure is suspected, such as implementing the licence condition 7 arrangements / by a formal "INF 1" notification.
- 6.42 Where an employee has been subjected to an overexposure, site inspectors should check that the employer has introduced a reduced dose limit for the remainder of the calendar year.

Co-operation between employers (Reg 15)

- 6.43 Where work undertaken by one employer is likely to give rise to the exposure to ionising radiation of the employee of another employer, this regulation requires those employers to co-operate to ensure that both are able to comply with the Regulations. An example would be where a contractor might carry out radiography on a nuclear site. In such a case, where the employees of either employer may be exposed to ionising radiation arising from work that is under the control of the other, the allocation of responsibility between the employers should be clear and documented.

Local Rules (Reg 17)

- 6.44 The Radiation Employer is required to set down in writing Local Rules for any controlled area or where appropriate, having regard to the nature of the work carried out there, any supervised area, as is appropriate to the radiation risk and nature of operations. Nuclear safety inspectors should check that these exist, are periodically reviewed and include key working instructions to restrict exposure during normal work and in the event of a radiation accident. Copies of the Local Rules should be prominently displayed at the entrance to the work area. These can take a variety of forms, including instructions, booklets and circulars. Visitors should be instructed in the requirements of the Local Rules. Information on contamination levels and / or local radiation levels, sometimes in the form of contour maps, may be appropriate. PPE requirements to enter the work area should be clear.
- 6.45 Essential content of the Local Rules are set out in Guidance (para 278). They should include the name of the relevant RPS and refer to the relevant Contingency Plan, which should cover a range of incidents, including minor events (e.g. spills of radioactive liquids or solids or gaseous releases).
- 6.46 The Radiation Employer must consult the RPA regarding implementation of requirements as to controlled and supervised areas within the Local Rules.

Control over Entry to Controlled Areas (Reg 18)

- 6.47 Inspectors should check that Controlled (and Supervised) areas are suitably demarcated, such as by fences, including signs indicating the risks arising from any sources or contamination in the area. Arrangements should be established for maintaining the means of demarcating the boundaries and for maintaining effective signage. Licensees and site operators often use a colour-coded system, set out in safety rules, for such signage.
- 6.48 Access to controlled areas should be limited to classified persons and others who are permitted entry only under the terms of written arrangements, (such as a written system of work). Such arrangements should be aimed at restricting exposure to ionising radiation by, for example, close supervision, restrictions on the type of work done, restriction on the time spent in the area and the use of PPE.

- 6.49 Provision should be made for estimating the dose likely to be received by non-classified workers, but this need not necessarily involve the issue of a personal dosimeter to them. For example, it may be acceptable for the host of a group of non-classified persons to wear a dosimeter, to give an indication of the dose received by group members. This practice can be applied to both TLD and neutron criticality belt dosimeters. Where classified persons are Outside Workers, then they should be subject to suitable training, instruction, dosimetry and PPE provided, following co-operation between their Employer and the Radiation Employer (i.e. the licensee).
- 6.50 The requirement for an area to be designated as 'supervised' is based on the need to keep the conditions of the area under review to determine whether the area should be designated as a controlled area, or on the likelihood of an employee receiving an effective dose in excess of 1mSv per year or an equivalent dose of one tenths of any dose limit. Hence those routinely working in supervised areas need not be designated as classified workers. Monitoring should normally involve individual dose estimation and recording and health surveillance.
- 6.51 Examples of good practice in the design of a changeroom, and of barrier procedure signage, are given in Appendices 4 and 5. Acknowledgement: These drawings have been prepared by the Industry Radiological Protection Co-ordination Group in developing a Nuclear Industry Code of Practice for Changerooms. "Nuclear Industry Code of Practice on Changeroom design, Operation and Maintenance", which was published by the Industry Radiological Protection Co-ordination Group (IRPCG), on behalf of the Nuclear Industry Safety Directors Forum (SDF) in July 2006. This is available on the internet at <http://www.irpcg.org/images/library/changerooms.pdf>.

Monitoring of Designated Areas (Reg 19)

- 6.52 Nuclear safety inspectors should ensure that all employers (i.e. contractors as well as the licensee) have arrangements to ensure that levels of ionising radiation are adequately monitored and that working conditions are kept under review. Suitable monitoring equipment should be provided. This may include external dose rate monitors, airborne contamination monitors, dust samplers, beta/gamma contamination monitors and alpha contamination monitors. Such instruments should be regularly maintained and tested and records kept of maintenance, test and monitoring results.
- 6.53 Inspectors should check that available radiation and contamination data is regularly collected and reviewed, to confirm that an area designation remains appropriate. It is not sufficient to rely solely on dose uptake trends for this purpose.

Storage and Accountancy of Radioactive Substances (Reg 28 & 29)

- 6.54 Also relates to the High Activity Sealed Radioactive Sources and Orphan Sources Regulations 2005, (Scotland and Northern Ireland) and the Environmental Permitting (England and Wales Regulations 2010 (which implement the UK's obligations under Euratom Directive 2003/122). On defence sites, MOD is the enforcing authority for HASS and security, however those aspects relating to IRR99 still apply.
- 6.55 Nuclear safety inspectors should consider inspecting the arrangements for storing and accounting for radioactive substances. In addition to the advice in the ACoP and Guidance, information on good practice is available in HSE Information Sheet Ionising Radiation Protection Series No. 8, which is available on the HSE website.
- 6.56 The definition of 'sealed sources' specifically excludes any radioactive substance inside a nuclear reactor or any nuclear fuel element.
- 6.57 Nuclear safety inspectors should check that adequate arrangements are in place for accounting for the location of all radioactive substances at any one time. Most of the

relevant radioactive substances at nuclear sites are likely to be solid sources for instrument calibration and checking, although some may be liquid solutions. The licensee should specify the precise type and nature of all sources held at the site. Arrangements should be in place to account for these at suitable intervals. When in use, they should be logged in and out of storage facilities. Enhanced attention should be given during inspections in regard of higher activity HASS source accountancy, where HASS sources are held at a site, the nuclear safety site inspector consulting with both the ONR-CNS and ONR-Safeguards site inspectors.

- 6.58 Sources should be clearly labelled with a unique identifier. They should be stored in secure receptacles, which prevent dispersal and provide appropriate shielding. The particular requirements of higher activity HASS sources should be recognised by the licensee and site inspectors should confirm this during the site inspection. Surface dose rates on the receptacle should always be less than 2 mSv per hour (and in most cases should be much less than this). As well as having sources uniquely identified, it is worth noting that photographs can be useful in case a source is lost. This is not a requirement, but it can help when a source becomes misplaced.
- 6.59 Sources should be held in secure, weatherproof stores, which provide a suitable level of fire resistance and shielding. Stores should provide physical security and should normally be kept locked. They should be used only for the storage of radioactive substances and ancillary containers, shielding and equipment. The store should be segregated from flammable or explosive materials. The store entrance should bear a suitable warning sign indicating that it contains radioactive substances. Nuclear safety inspectors should ensure that radiological surveys are routinely carried out within and surrounding the store to confirm the appropriate area designation. Ventilation should be available to prevent airborne accumulations (sometimes including radon from the building materials) and may need to be operated for a period before entering the store.
- 6.60 In view of security issues, the nuclear safety inspector should discuss arrangements for the accountancy and storage of radioactive materials with both the ONR - CNS and ONR – Safeguards site inspectors, and should address any perceived weakness in the security arrangements as a matter of urgency.
- 6.61 Licensees and site operators should be encouraged to dispose of all unwanted sources, as these can present avoidable safety and security risks.
- 6.62 A register should be maintained, using appropriate media, including the identifier of each source, its date of receipt, activity at a specified date, current location and, where appropriate, the date and manner of disposal and to whom it was sent. The arrangements should be audited regularly (preferably at least annually). Records should be kept for at least 2 years from the date of the last record entry or disposal.

Dose Assessment (Regulation 21) and Approval of Dosimetry Services (ADS) (Regulation 35)

- 6.63 All employers (including nuclear site licensees and their contractors) should make arrangements for the assessment and recording of radiation doses incurred by classified persons in their employ, where such doses may be significant. Employers are required to cooperate in this respect and, in many cases, contractors or tenant organisations use the dosimetry services appointed by the nuclear site licensee. Employers should be an "intelligent customer" of such services.
- 6.64 HSE approves dosimetry services under the arrangements set out in Reg 35. Approved services are required to meet the published requirements. At sites regulated by ONR, such services are usually inspected by ONR specialist radiological protection nuclear safety inspectors and site nuclear safety inspectors would not normally be expected to address this topic.

- 6.65 Inspectors should raise any query concerning the services provided by ADS with the relevant ONR / HSE specialist radiological protection inspector.
- 6.66 More information on HSE's approval of dosimetry services is available in HSE Information Sheet Ionising Radiation Protection Series No. 2, which is available on the HSE website.

Notifications

- 6.67 Site inspectors may wish to consider referring IRR99 related notifications for specialist assessment where, for example:
- A request has been made for a special entry in an individual's dose record to remove a recorded dose in excess of a statutory dose limit [IRR99 Regulation 23 (8)].
 - There has been, or there was potential for, a dose to an individual above a statutory dose limit [IRR99 Regulation 25 (1)].
 - There has been, or there is likely to have been, a release of radioactivity or spill of radioactive material that was above or approaching the statutory reporting limits [IRR99 Regulation 30 (1)]. Such events, which meet the Ministerial reporting criteria, are also recorded in the quarterly statement of events on nuclear sites reported formally to Ministers and recorded on the ONR web site at <http://www.onr.org.uk/quarterly-stat/index.htm>
 - There is reasonable cause to believe that radioactive material above the statutory reporting limit has been lost or stolen [IRR99 Regulation 30 (3)]. The enhanced significance of higher activity HASS sources should be recognised by the licensee and by the site inspector. The ONR-CNS inspector should also be promptly informed in such instances. (For sites having a medical department) the malfunction of radiation equipment used for medical diagnosis or treatment resulting in the exposure of a patient which was much greater than intended [IRR99 Regulation 32 (6)].

7. FURTHER READING

Further reading includes:

Appendix 1: HSE Guidance relevant to The Ionising Radiations Regulations 1999;

Appendix 2: IRR99 Regulation 8 – Restriction of exposure good practice;

Appendix 3: IRR99 Regulation 18 - Example of Good Practice in Change Room Design;

Appendix 4: IRR99 Reg 18 - Example of Good Practice in Change Room Barrier Procedure Signage;

Appendix 5: Examples of enforcement action taken by ONR (and predecessor NII) in relation to The Ionising Radiations Regulations 1999 (and by NII relating to the predecessor Ionising Radiations Regulations 1985).

8. DEFINITIONS

IRR99	The Ionising Radiations Regulations 1999
IRR 85	The Ionising Radiations Regulations 1985, (which were replaced by The Ionising Radiations Regulations 1999)
ACoP	Approved Code of Practice
HSE	The Health and Safety Executive
NII	HM Nuclear Installations Inspectorate, predecessor organisation for the Nuclear Safety section of the Office for Nuclear Regulation
ONR	Office for Nuclear Regulation
ALARP	As Low As Reasonably Practicable
SFAIRP	So Far As Is Reasonably Practicable
ADS	Approved Dosimetry Service
PPE	Personal Protective Equipment
RPE	Respiratory Protective Equipment
Reg	Regulation forming part of The Ionising Radiations Regulations 1999
DAP	Duly Authorised Person, in accordance with nuclear site licence condition 12
SQEP	Suitably Qualified and Experienced Person, in accordance with nuclear site licence condition 12.
RPA	Radiation Protection Adviser
RPS	Radiation Protection Supervisor
NVQ	National Vocational Qualification
LC	Nuclear Site Licence Condition
PHE	Public Health England, (which incorporates the work of the Health Protection Agency, formerly encompassing the work of the National Radiological Protection Board)
HASS	High Activity Sealed Sources

9. APPENDICES

APPENDIX 1

HSE GUIDANCE RELEVANT TO THE IONISING RADIATIONS REGULATIONS 1999

RADIATION PROTECTION PUBLICATIONS

- Work with ionising radiation HSC Approved Code of Practice (ACoP) and guidance in support of IRR99. ISBN 0 7176 1746 7 reference L121 HSE Books.
- A guide to the Radiation (Emergency Preparedness and Public Information) Regulations 2001 ISBN 0 7176 2240 1 reference L126 HSE Books
- INDG334 Working safely with ionising radiation : guidelines for expectant or breastfeeding mothers .
- Radon in the workplace
- Medical exposure

Also relevant is the HSE guidance on Controlling Airborne Contaminants in publication HSG 258, on the HSE web site at www.hse.gov.uk/pubns/books/hsg258.htm

Ionising Radiation Protection Series HSE Information Sheets

- No. 1 - Industrial radiography - managing radiation risks 
- No. 2 - Radiation doses - assessment and recording 
- No. 3 - Portable nuclear moisture/density gauges in the construction industry 
- No. 4 - Outside workers 
- No. 5 - Prior authorisation 
- No. 6 - Radiation protection supervisors 
- No. 7 - Selection, use and maintenance of portable monitoring Instruments 
- No. 8 - Control of radioactive substances 

- Appropriate designation of classified persons
- Wear your dosimeter 
- Dose constraints for comforters and carers - research report
- Adequacy of external dosimetry methods and suitability of personal dosimeters for workplace radiation fields – research report
- Information to accompany patients undergoing nuclear medicine procedures – research report
- Doses to the embryo/foetus and neonate from intakes of radionuclides by the mother – research report

There is also general HSE guidance to Inspectors on aspects of IRR99 on the HSE intranet at <http://intranet/yourhealthsafety/health/ionisingradiation/guidance/>

GUIDANCE FOR INSPECTORS

USES OF IONISING RADIATION IN THE WORKPLACE.

Contents

- Introduction
- Structure of document
- Sources not included and existing guidance
- Identification of sources
- Inspector's health and safety
- Exercising your powers
- Overview of The Ionising Radiations Regulations 1999
- General issues applicable to all uses of ionising radiation
- Statutory notifications
- Notification vs. Prior authorisation
- Are all exposures significant?

Annexes

All the files listed below are in PDF format

- 1 Ionising radiation – basic questions and answers
- 2 Gauging applications
- 3 Nuclear moisture/density gauges
- 4 X-ray security equipment
- 5 Portable x-ray security equipment
- 6 X-ray diffraction and x-ray fluorescence equipment
- 7 X-radiography within shielded enclosures
- 8 Gamma radiography within shielded enclosures
- 9 Site radiography
- 10 Electron beam welders
- 11 Ion implanters
- 12 Irradiators
- 13 Scanning and transmission electron microscopes
- 14 Diagnostic radiology
- 15 a Diagnostic nuclear medicine
- 15 b Therapeutic nuclear medicine
- 16 External beam radiotherapy
- 17 Brachytherapy
- 18 Veterinary radiography
- 19 Well logging
- 20 Oil separation profiler
- 21 Static eliminator devices
- 22 Miscellaneous radiation sources
- 23 Radioactive sources not installed in equipment
- 24 Unsealed radioactive materials
- 25 Particle accelerators

Photographic images

All photographs supplied by kind permission of the former Health Protection Agency's Radiation Protection Division, who retain copyright for the images, with the exception of the following contributions to the document:

Annex 6 (close up of open beam set up).

Annex 12 (small irradiator).

Annex 22 (smoke detector).

Annex 17 (brachytherapy equipment).

Other publications

Public Health England, (PHE) Radiation Protection Division's "Living with radiation" provides detailed information on all aspects of ionising and non-ionising radiation and is a valuable source of general information, e.g. it was useful to provide information from this document to the Magistrates Court, when taking enforcement action, providing basic radiation information and radiological protection matters, suitable for a layman.

PHE also produces periodic publications on the ionising radiation exposure of the UK population.

"Health risks from radon" outlines the main facts about radon and explains what policies and practical measures can be used to control exposures.

- [Public Health England Radiation Protection Division's publications menu](#) 

Appendix 2

IRR99 Reg 8 - Restriction of Exposure - Good Practice.

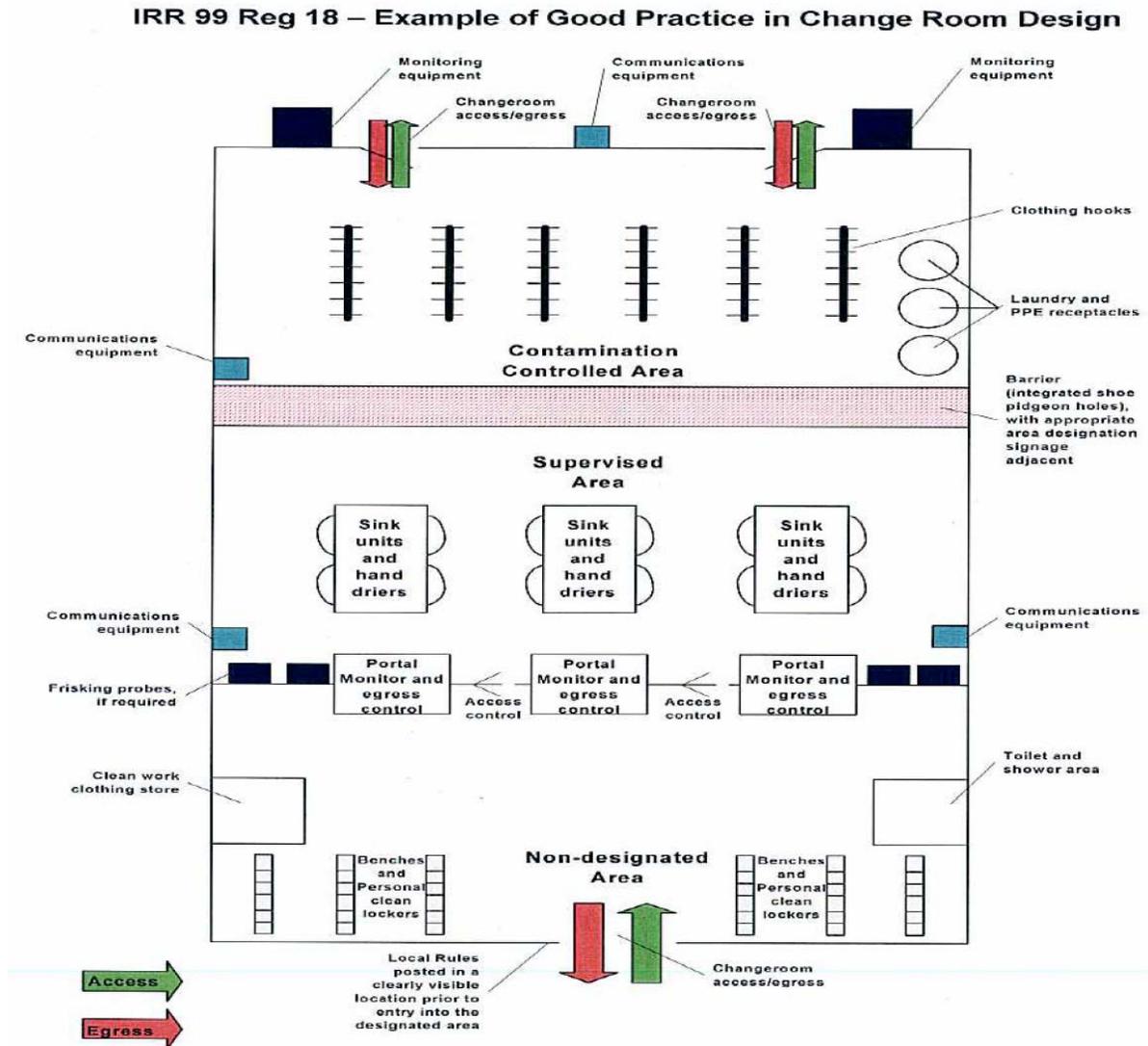
1. Duty holders should be aware of and apply relevant good practice. Good practice is the generic term for those standards for controlling risk which have been judged and recognised by HSE as satisfying the law when applied to a particular relevant case in an appropriate manner. The main sources of written, recognised good practice include HSC Approved Codes of Practice (ACoPs), in particular the combined ACoP and Guidance document for IRR99, HSE Guidance, ICRP recommendations and guidance, British Standards and guidance produced by a relevant recognised body such as the Society for Radiological Protection, as well as good practices used at other facilities and sites which can be promulgated by ONR. There may also be unwritten sources of well defined and established standard practice adopted by the radiation protection community.
2. Work planning and scheduling programmes should be adopted which include the use of:
 - decision aiding techniques,
 - ALARP checklists to identify those factors that need to be considered before work is carried out,
 - checklists for pre-job and post-job briefings,
 - task feedback.
3. Estimates should be made of the likely occupational exposures prior to the commencement of work and these estimates should be reviewed after the work, investigating the reasons for differences between estimated and actual accrued doses. Dose sharing as a primary means of managing exposures should be avoided.
4. Dose reduction working groups, set up to identify improvements in plant operations and work practices that would reduce occupational doses. Such groups often involve members from the plant operations and management; many examples of workforce engagement, often through safety representatives, continue to deliver reduced occupational doses.
5. The adoption of a hierarchy of controls. The restriction of doses should be preferably by means of engineering controls and design features, then supporting systems of work and lastly personal protective equipment.
6. Training of staff at all levels about radiation doses and the importance of reducing occupational doses.
7. Training on tasks to be carried out e.g. the use of mock-ups, in order to familiarise workers with potential problems and to improve their skills in carrying out the tasks. In this way, tasks can be carried out more efficiently in a challenging radiation environment, thus reducing occupational doses.
8. The setting of realistic dose targets for specific tasks or for work carried out during a specific period e.g. shift targets. Close attention to such dose assessments, e.g. by closely monitoring predicted and then assessing actual radiation doses can identify measures to reduce occupational radiation exposure.
9. There should be reviews of the effectiveness of the ALARP measures (e.g. expected doses and actual doses may be compared during major projects, whilst work is in progress, or detailed task doses).
10. There should be demonstrable management commitment to these radiation exposure control practices.

Appendix 3

IRR99 Reg 18 - Example of Good Practice in Change Room Design

Acknowledgement: This drawing has been prepared by the Industry Radiological Protection Co-ordination Group in developing a Nuclear Industry Code of Practice for Changerooms.

<http://irpcg.org/images/docs/changerooms.pdf>.

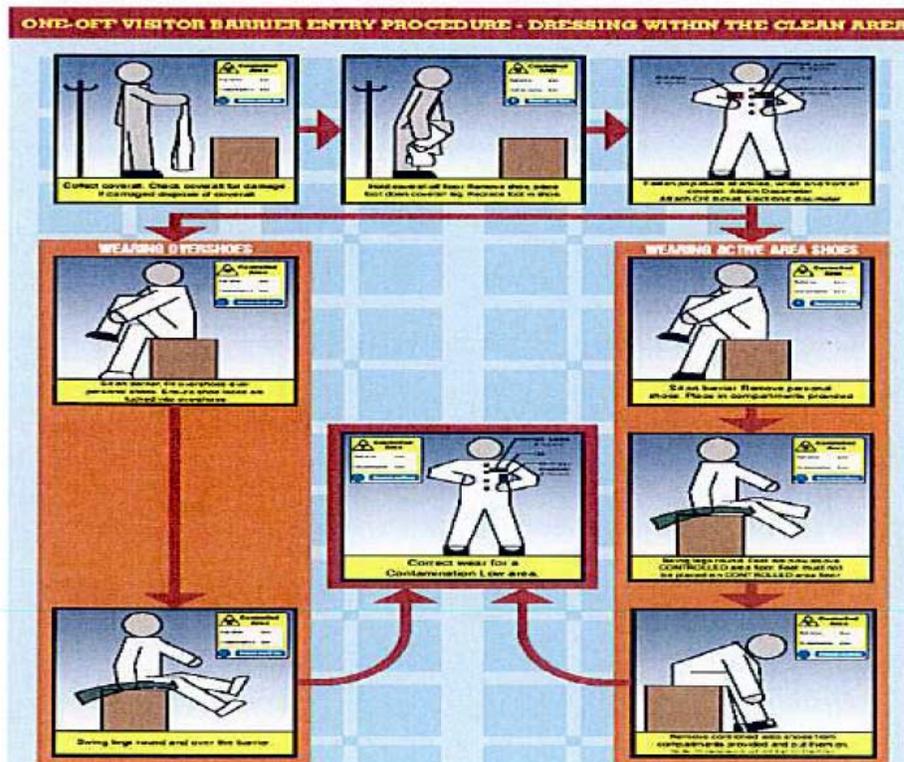
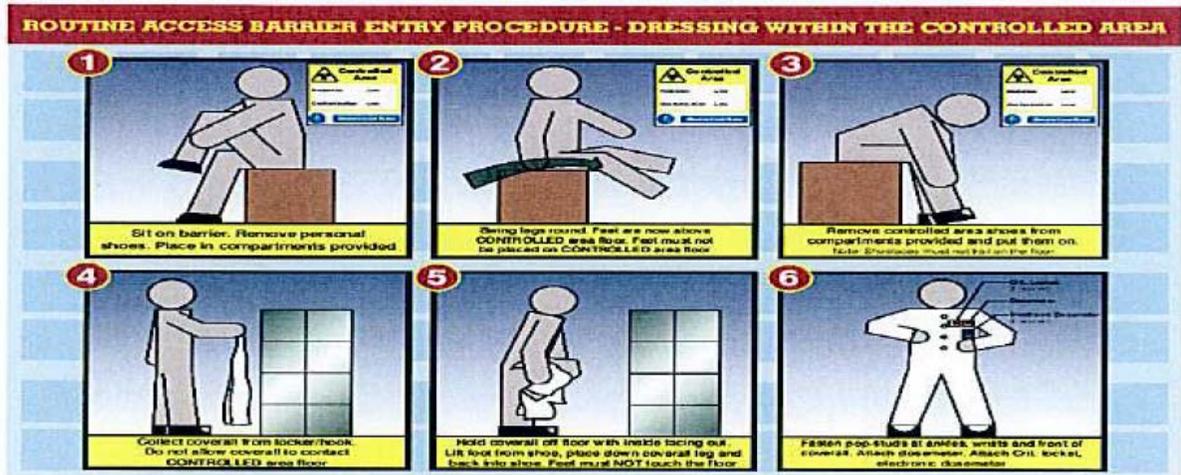


The Nuclear Industry Code of Practice on Changeroom Design, Operation and Maintenance was published by the Industry Radiological Protection Co-ordination Group (IRPCG) on behalf of the Nuclear Industry Safety Directors Forum (SDF) in July 2006.

APPENDIX 4.

IRR99 REG 18 - EXAMPLE OF GOOD PRACTICE IN CHANGE ROOM BARRIER PROCEDURE SIGNAGE.

Acknowledgement: These drawings have been prepared by the Industry Radiological Protection Co-ordination Group in developing a Nuclear Industry Code of Practice for Changerooms. <http://irpcg.org/images/docs/changerooms.pdf>.



Appendix 5.**Examples of enforcement action taken by ONR (and the predecessor NII) in relation to The Ionising Radiations Regulations 1999 (and by NII relating to the predecessor Ionising Radiations Regulations 1985).**

Date	IRR 85 Regulation breach	Enforcement Action taken	IRR99 Regulation breach
Event: April 1992 Magistrates Court: April 1993	Regulation 6, restriction of exposure and Regulation 25, assessment of hazards.	Prosecution. Licensee was opening up some old radioactive material containers, leading to an uncontrolled gaseous release of radioactive material.	
April 1994	IRR 85 Regulation 13 (7).	Improvement Notice issued. Following an incident on a site in January 1994, an employee received an abnormal radiation dose whilst working in a significant field of ionising radiations and this dose could not be assessed. An estimated dose or a notional dose had not been entered in the dose record for the employee.	
Event: September 1993 Magistrates Court: March 1995	6(1) of IRR 85 & 11(1) of IRR 85. 6(1) Every employer shall, in relation to any work with ionising radiation that he undertakes, take all necessary steps to restrict so far as reasonably practicable the extent to which his employees and other persons are exposed to ionising radiation. 11 (1) Every employer who undertakes work with ionising radiation shall make and set down in writing local rules for the purpose of enabling the work with ionising radiation to be carried on in compliance with the	Successful prosecution, (defended in Magistrates court by the licensee). Licensee's employee received an avoidable radiation dose of 2 mSv, (potentially much higher).	

	requirements of these Regulations and shall ensure that such of those rules as are relevant are brought to the attention of those employees and other persons who may be affected by them.		
Event: October 1994 to October 1995 and May 1998 Sheriff Court: March 2000	Three charges under Regulation 7 of IRR 85.	Prosecution.	
Event: December 1997 Magistrates Court: August 1998	Regulation 6.	Prosecution. Radioactive material accidentally released in to a laboratory during dismantling of glove box pipework. Two individuals received internal doses by inhalation.	
Event: July 2000 Magistrates Court: October 2000	Two charges under Regulation 28 relating to the management of sealed sources and one charge under Regulation 27 (3) for failure to comply with an Improvement Notice.	Prosecution. Licensee misplaced a sealed radioactive source, failed to keep adequate records of the quantity and location of sealed radioactive sources and also failed to comply with an Improvement Notice, which had been extended by four months. Checks were found not to be being carried out and proper records for the sources were not being kept.	
Event: January 2001 Magistrates Court: March 2002	Regulations 7 and 8.	Prosecution.	
Event: March 2002		A joint HSE/DfT prosecution followed an incident when a	Failed to take all necessary steps to

Crown Court: February 2006		<p>contractor was transporting radioactive materials, previously used in cancer treatment at a hospital and transporting it by road to a licensed site, for disposal. At the licensed site, very high radiation levels were discovered coming from the specialist container used to transport the material.</p> <p>A joint HSE/DfT investigation revealed the fact that a vital shield plug was missing from the transport container, allowing a beam of radiation to emit from its base, and this had gone unnoticed. A primary cause of the incident was the company's failure to supervise and support their staff properly.</p>	<p>restrict, so far as reasonably practicable, the extent to which employees and others were exposed to ionising radiation, contrary to Regulation 8 (1) of IRR99.</p> <p>Failed to ensure that ionising radiation levels were adequately monitored, contrary to Regulation 19 (1).</p>
October 2004		Improvement Notice issued. Nuclear matter stored in crates was not stored in accordance with adequate arrangements and was not, so far as was reasonably practicable, kept in suitable receptacles and in a suitable store. (Improvement sought by May 2005).	Regulation 29 (1) – Every radiation employer shall ensure, so far as is reasonably practicable, that any radioactive substance under his control which is not for the time being in use or being moved, transported or disposed of – (a) is kept in a suitable receptacle; and (b) is kept in a suitable store.
October 2004		Improvement Notice issued. Nuclear matter was not stored in accordance with adequate arrangements and was not, so far as was reasonably practicable, kept in suitable receptacles and in a suitable store. (Improvement sought by May 2006).	Regulation 29 (1) – Every radiation employer shall ensure, so far as is reasonably practicable, that any radioactive substance under his control which is not for the time being in use or being moved, transported or disposed of – (a) is kept in a suitable receptacle; and (b) is kept in a suitable store.
December 2006		Improvement Notice issued. Licensee's arrangements were	Regulations 21 (1) and 21 (2).

		unsuitable, such that significant radiation doses to workers on the licensed site could go unassessed and hence unrecorded. This related to a requirement to assess an internal radiation dose uptake and to revise the related compliance arrangements. Compliance sought by September 2007.	
July 2008		Improvement Notice issued. Within a decommissioning area, the employer did not make a suitable and sufficient assessment of the radiation hazards in the area, to adequately restrict exposure to ionising radiation. This related to a shortfall in the assessment of radiation hazards in a decommissioning area, to identify the measures required to restrict exposure, in particular, by using engineering controls and design features.	Regulation 7 (1) and Regulation 7 (2).
August 2008.		Improvement Notice issued. Failure to make and implement adequate arrangements for the regular and systematic examination, inspection, maintenance and testing of glove box equipment.	Regulation 10 (1).
July 2011		Improvement Notice issued. Repeated examples of employees failing to use monitoring equipment. Verbal and written advice provided by ONR to licensee but observed shortfalls repeated, hence an Improvement Notice was issued, due to repeated observed failures by licensee staff to monitor on exiting from areas designated under IRR 1999 (in contravention of Local Rules).	Regulation 17 (2) - The radiation employer shall take all reasonable steps to ensure that any local rules made pursuant to paragraph (1) and which are relevant to the work being carried out are observed.
June 2013		Improvement Notice issued. Failure to take the steps necessary to ensure that plant equipment was designed and constructed that they are safe and without risks to health including risks from ionising radiation, when they are being set, used, cleaned or maintained by a person at work.	Regulation 31

June 2015		Improvement Notice issued. No plan in writing setting out emergency arrangements appropriate for the carriage of packages containing class 7 goods, no was there such a plan made in writing by you as the carrier ahead of road carriage of packages containing Class 7 goods on at least two occasions during 2014.	Regulation 24 (2) Schedule 2 Part 4 (1) and (2) if the Carriage of Dangerous Goods and the use of Transportable Pressure Equipment Regulations 2009
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