Radiation Safety Procedures for the Use of Sources of Ionising Radiation.

Trinity College, Dublin.

(Amended and updated by the College RPO, Mr. Tom Merriman in Aug 2014)

SCOPE AND APPLICABILITY

These procedures apply to all schools / departments using radioactive isotopes or X-ray apparatus for any purpose unless exempted under Paragraph 2.
The requirements of these procedures are additional to those imposed in the licence granted to the College by the Radiological Protection Institute of Ireland. These procedures are specifically cited in the schedules to the licence.

These procedures do not apply in the following cases:-
(a) X-ray equipment that is incapable of operating above 30kV, provided that the dose rate does not exceed 1 microsievert per hour at any point situated 0.1 m from any accessible part of the surface.

(b) Any radioactive substances :
(1) where the quantities involved do not exceed in total the exemption values set out in column 2 of Table A to Annex 1 of The Radiological Protection Act 1991 (Ionising Radiation Order) 2000 ,S.I. No. 125 of 2000.
Or
(2) where the concentrations of radioactivity per unit mass do not exceed the exemption values set out in column 3 of Table A to Annex 1 of S.I. No. 125 of 2000.

(c) Any other substances or apparatus exempted under Article 4 of S.I. No. 125 of 2000.

RADIOLOGICAL SAFETY COMMITTEE

Formal control of sources of ionising radiation in all College schools / departments shall be exercised by the College Radiological Protection Officer (RPO), and the College Radiological Safety Committee. All research projects making use of sources of ionising radiation must have the approval of the College RPO, and in some cases, where the College RPO deems it necessary, may also need the approval of the College Radiological Safety Committee. Such approval must be obtained at the planning stage of the project. Any significant changes to the project which may affect radiological protection measures in place, must also be notified to and approved by the College RPO.
The College Radiological Safety Committee will advise, guide and direct the College RPO with regard to radiological safety matters and radiation safety policy decisions in accordance with the Radiological Safety Committee approved terms of reference.

HEADS OF SCHOOLS / DEPARTMENTS

Individual heads of schools / departments are responsible for the safe use of sources of ionising radiation within their areas. Each head of a school / department which uses a source or sources of ionising radiation must nominate, for approval by the College Radiological Safety Committee and the Radiological Protection Institute of Ireland, one member of staff who will be responsible for the keeping of records and the day to day management of radiological safety issues within the school / department. This individual will be known as the School or Departmental Radiological Protection Supervisor (RPS)

RADIOLOGICAL PROTECTION SUPERVISOR (RPS)

The RPS plays a supervisory role in assisting College to comply with the requirements of the legislation and in ensuring compliance with College Radiation Safety Procedures and best practice procedures. The RPS must be approved by the RPII and their name must be listed in Schedule 3 of the College RPII licence.

Work with sources of ionising radiation may not be carried out in any school / department without the written permission of the School / Departmental Radiological Protection Supervisor in the first instance. Working with ionising radiation in College is on a permit to work basis. Only authorised personnel are entitled to work with ionising radiation. Any persons intending to work with radioactive materials, whether these are sealed or unsealed sources, or with irradiating apparatus, must first register with their School / Departmental Radiological Protection Supervisor and complete a permit to work registration form to seek permission to use ionising radiation in College. The School / Departmental Radiological Protection Supervisor is authorised to refuse permission to undertake work with ionising radiation in the department if he / she

is not satisfied that the necessary safety requirements can be met. The School / Departmental Radiological Protection Supervisor is also authorised to require that a work activity with ionising radiation, which he/ she deems to be unsafe, or in contravention of the College licence requirements, or in contravention of the College Radiation Safety Procedures, cease or be suspended until appropriate control measures are implemented. The School / Departmental Radiological Protection Supervisor should, where possible, consult with the College Radiological Protection Officer (RPO) before taking such action, but may, in the event of an emergency for instance, or where consultation with the RPO is not possible, make such a decision without consultation.

There are a number of schools / departments in College who are either presently working with sources of ionising radiation or irradiating apparatus, or who have been working with sources of ionising radiation or irradiating apparatus, and may resume such work in the future. Each of these areas has an RPS who has been approved by the RPII.

The relevant schools / departments and their RPS's are outlined in Schedule 3 of the College licence which can be viewed on the College Radiation Safety website.

http://www.tcd.ie/Buildings/Safety/rswelcome.php

The main role of the RPS is to ensure at a school / departmental level that the radiological protection requirements as determined by Irish legislation, the College licence provisions, and these College Radiation Safety Procedures, are complied with by personnel working with radiation, within their department. This includes ensuring that the following general arrangements are implemented;

a) Ensuring that all radioactive sources are labelled, segregated from other substances, and kept in a safe and secure location.
b) Ensuring that a warning system is in place for rooms containing irradiating apparatus, that there is appropriate signposting of radiochemical labs with trefoil signs, and signposting and control of controlled and supervised areas.
c)Ensuring that a copy of the College licence and these College Radiation Safety Procedures are displayed within the department and ensuring that all users are aware of these and other relevant information, which is passed to the RPS by the RPO or Radiation Safety Committee.
d) Ensuring that sources of ionising radiation or irradiating apparatus are only acquired in the department with the prior approval of the RPS and RPO.
e) Ensuring that dosimetry badges are provided to all personnel likely to be exposed, that adequate records are maintained, and that high levels of exposure are investigated, and reported to the RPO and RPII.

f) Ensuring that routine checks and maintenance are carried out on irradiating equipment, in accordance with manufacturer's instructions, and ensuring that no modifications are undertaken to irradiating equipment without the prior approval of the RPO.
g) Ensuring that leak tests of sealed sources are undertaken every 2 years.
h) Ensuring that adequate contamination monitoring programmes are implemented in radioactive work areas and ensuring that contamination levels are kept within the limits recommended in the College licence.
i) Ensuring that no radioactive source or irradiating apparatus is disposed of without the prior approval of the RPS and the RPO, and ensuring that disposal is only undertaken in accordance with agreed and approved procedures.
j) Arranging for the disposal of all departmental radioactive waste in accordance with approved procedures, and liasing with the RPO as necessary. Keeping adequate records of all radioactive waste disposed of within the department.
k) Keeping all relevant records as required by the College licence and relevant legislation, and having such records available for inspection by the College RPO and the RPII.
l) Exercising control over the acquisition and disposal of sources, maintaining an inventory of sources within the department, and ensuring that there are no unlicensed sources in the department, and that the quantities of radionuclide which are brought into the department at any time do not exceed licence requirements.
m) Keeping records of the quantity and nature of each radionuclide. Keeping records of the usage and disposal of each source. Providing an annual statement to the RPO of what radioactive sources were used in the past year and what radioactive sources will be used in the coming year.
n) Ensuring that all new projects involving the use of ionising radiation within the department receive the prior approval of the College RPO
o) Ensuring that all departmental personnel working with radiation are aware of the College licence conditions, and these College Radiation Safety Procedures, and satisfy competence requirements, and as a minimum requirement, attend the annual College Radiation Safety workshop.
p) Ensuring that the department has an adequate number of monitoring instruments, & that they are calibrated regularly (every 12 months)
q) Ensuring that persons working with unsealed sources wear suitable gloves, safety glasses, and white coats & that persons working with unsealed sources in volatile / powdered form work only in a fume cupboard.
r) Taking appropriate measures on being notified of spillages, and advising the RPO if there is a possibility of exposure to excessive levels.
s) Arranging for solid waste bags to be disposed of through the RPO at regular intervals, and arranging for liquid wastes to be disposed of down

designated drains after ensuring compliance with tables in SI 125 of 2000, ensuring waste is water soluble and not flammable, and ensuring that disposal certificates are completed.
Arranging for non water-soluble or flammable liquid waste to be disposed of as for chemical waste, when within limits and certified on the appropriate triplicate form. Ensuring that one copy of these certificates is forwarded to the College RPO once annually.

Note: By law, 'the undertaking', ie. the College, heads of individual departments and each individual person working with sources of ionising radiation carries ultimate responsibility for compliance with radiation legislation. This responsibility can not be delegated to the RPS nor to the RPO.

RADIATION WORKERS

Each individual in College working with ionising radiation is legally responsible for taking all due care for their own health and safety and the health and safety of anyone who may be affected by their work activities. All radiation workers in College are obliged to familiarise themselves with and to comply with the conditions of the College licence, and these College Radiation Safety Procedures. All radiation workers in College are obliged to consult with their RPS before undertaking any work with ionising radiation, and as necessary during the course of their work. All radiation workers in College are obliged to co-operate with their RPS in complying with the provisions of these Radiation Safety Procedures, and are obliged to comply with any recommendations or advice given by the RPS.

COLLEGE RADIOLOGICAL PROTECTION OFFICER (RPO)

Overall supervision and advice on radiological safety is the responsibility of the College Radiological Protection Officer (RPO).
The College Radiological Protection Officer is Mr. Tom Merriman. Phone 8961914, E-Mail: tom.merriman@tcd.ie.
The Radiological Protection Officer may and indeed, must be consulted on certain issues but the ultimate responsibility for radiation safety in College rests with the College and with individuals within College departments who are working with radiation.

The duties of the RPO include the following;
a)To provide information and advice on all aspects of radiation protection in College.
b)To aim to maintain radiation exposures at the lowest possible level by co-ordinating the radiation protection service in College.

c)To ensure that accurate records are maintained of personnel exposure and of incidents involving contamination or of any radiological significance.
d)To ensure that appropriate instruction is given in the proper procedures to be used and in the use of equipment necessary for safe working with ionising radiation.
e)To ensure that monitoring equipment is regularly checked and calibrated.
f)To ensure that records are maintained of importation, usage, storage and disposal of radioactive materials as may be required by the RPII.
g)To ensure that all users of radioactive materials are informed of appropriate safety rules and national legislation as may be applicable.
h)To carry out such other duties concerning radiation safety as may be required by the Radiological Safety Committee.

The College Radiological Protection Officer is authorised to refuse permission to undertake work with ionising radiation in any College department if she is not satisfied that the necessary safety requirements can be met. The College Radiological Protection Officer is also authorised to require that a work activity with ionising radiation, which she deems to be unsafe, or in contravention of the College licence requirements, or in contravention of the College Radiation Safety Procedures, cease or be suspended until appropriate control measures are implemented.

The College Radiological Protection Officer (Mr. Tom Merriman) has also been appointed as the College Radiation Protection Adviser in accordance with Article 19 of The Radiological Protection Act 1991 (Ionising Radiation Order) 2000 ,S.I. No. 125 of 2000.

RADIATION PROTECTION ADVISER (RPA)

The College is required to appoint a competent qualified expert, known as a 'Radiation Protection Adviser' from the list of RPII approved Radiation Protection Advisers, in accordance with Article 19 of the Radiological Protection Act 1991(Ionisation Order) 2000.

The College RPO has agreed to also act as the College RPA.

The RPA must be consulted with regard to the following matters:

(a) The examination and testing of protective devices and measuring instruments
(b) The prior critical examination of plans for ionising installations from the point of view of radiation protection
(c) The acceptance into service of new or modified sources from the point of view of radiation protection
(d) The regular calibration of measuring instruments and the regular checking

that they are correctly used
(e) The designation of Controlled and Supervised areas
(f) Appropriate quality assurance programmes including quality control measures to be taken for irradiating apparatus, nuclear devices and radioactive substances
(g) The estimation of radiation doses

DOSIMETRY

If a possibility of exposure to significant levels (i.e., greater than 1 mSv yr^{-1}) of penetrating radiation exists, the RPS will arrange for the issue of personal dosemeters to each person who may be exposed. The RPS will ensure that a record is kept of the exposures recorded by such personal dosemeters. Such records must be kept for a period of at least 5 years, but it is recommended that they are kept indefinitely. Any dosemeter must never be used by more than one person.

RECORDS

A record will be kept by each school / department of the quantity and nature of each radionuclide present in the department. This record will also give details of the usage and disposal of the radionuclide and contamination monitoring undertaken on a day to day basis.

SIGNAGE

Each room in which radioactive materials or radiation sources are stored or used will have the internationally agreed black and yellow symbol for radiation prominently displayed at the entrance to the room. The radiation safety procedures also be permanently mounted in a conspicuous position within the room.

ORDERING

The ordering of all sources of ionising radiation at departmental level, whether sealed, unsealed or new irradiating apparatus, must be approved by the Radiological Protection Supervisor, and order forms must be officially signed off by the Radiological Protection Supervisor. These safety procedures prevent radioactive sources or radiochemicals which are not on the College licence being brought into College and also ensure that the quantities of materials ordered are within specified limits on our licence. These procedures also prevent unauthorised personnel from ordering and / or working with radioactive materials.

TRANSPORT

All licensed radioactive sources shall be shielded, packaged and transported in accordance with the International Atomic Energy Agency's Regulations for the safe transport of radioactive material, and in accordance with the conditions outlined in the College licence.
The RPS will ensure that users of radionuclides understand the international transport labels affixed to the packages in which isotopes are delivered and the relative hazards, which are indicated by such labelling, so that appropriate precautions can be taken. Please note that College is not licensed to transport radioactive substances. Any courier or transport company used to transport radioactive materials in to the College must have an RPII licence.

SPILLS AND EMERGENCIES

All spills or other accidents involving radioactive materials must be reported to the RPS at once. The College Radiological Protection Officer should also be informed if the possibility of contamination or external exposure of workers or other persons exists as a result of the accident.
In the event of an emergency situation, the Radiological Protection Supervisor should be contacted immediately to give advice and guidance on procedures to be followed. If the RPS is not immediately available the College RPO should be contacted at 01-8962887, or on the following mobile phone number: 087-2644107 (for use in emergencies only). The College security centre should also be contacted at ext. 1999 or (01-8961999) and advised of the situation. If the emergency services need to be contacted such as the fire brigade or ambulance, these should be contacted through the College security staff who can open gates for them and direct them into the appropriate area of College etc.
Examples of emergency situations would include fire or explosion in a building / room containing radioactive materials, loss or theft of any licensed item, damage to, leakage from or other incident / accident involving a licensed item. In the event of an emergency situation, the RPII should also be contacted and notified at 01-2697766. They can also offer advice and guidance.
Each radiation worker must familiarise themselves with individual departmental emergency procedures and must discuss this matter, and their role in implementing departmental emergency procedures with their departmental radiological protection supervisor before commencing work with sources of ionising radiation. More detailed emergency procedures are outlined in the College document entitled 'College Radiation Emergency Procedures'. All users of ionising radiation in College should be familiar with these procedures.

WASTE

The disposal of solid radioactive waste from laboratories using radioactive materials will be arranged by the Radiological Protection Supervisor at regular intervals in accordance with the requirements of the Radiological Protection Institute of Ireland. Such waste should be stored in appropriate containers under cover in a vermin free environment until collection for disposal has been arranged.

The following procedures must be complied with in disposing of waste;

Solid waste: Is placed in UN approved yellow bags. Only 'soft solid waste' should be put in these bags, i.e. nothing should be put in a yellow bag with a sharp edge which may pierce the bag, examples of types of waste which should not be placed in yellow bags would include; pippette tips, disposable pasteur pippettes, microfuge tubes etc. These types of wastes are considered 'sharps' and must be placed either in an appropriate sized sharps bin (6.5, 12.5, or 23 litre bins) or in a yellow bag within a 50 litre yellow 'Sulu Bin'.
The waste disposal contractors will not accept bags if they have been pierced by sharp materials, and the rejected bags then have to be returned to the producer for recontainment in the appropriate waste bin. Correct containment at the outset will therefore save a lot of time.
All 'soft solid wastes' can be placed in yellow bags, ie. gloves etc.
A number of conditions must also be satisfied in relation to such bags of soft solid waste before the waste disposal contractors will accept these bags.
- Bags must not be more than ¾ full.
- Only 5oo gauge UN approved bags to be used.
- No radioactive tape or markings.
- Bags must be properly secured and tagged.
- Wet or soiled bags will not be accepted.
- Bags containing sharps will not be accepted.
- Bags, which are holed, damaged or leaking will not be accepted.

The waste must then be stored in a secure area, to which access is only available through the RPS, until it has decayed to background levels, at which time the College RPO should be contacted to monitor the bags with the RPS and arrange a waste collection through the waste disposal contractors. The RPS must complete a C1 Form (required by the Waste Mgt. Regulations 1998). The waste disposal contractors will not take a waste consignment from any dept. without a completed C1 form. A hazardous waste code number has to be noted on this form. It is up to each RPS to review the various categories of waste indicated and determine which is most appropriate for the waste being produced by their department, however, for many departments, the Category: 'Waste from human or animal health care and or related research', code no. 180000, is appropriate.

Liquid waste: Liquid wastes, such as waste scintillation fluids etc. must be certified on the College approved triplicate forms, as being within the approved limits set by S.I. 125 of 2000, before being disposed of down approved drains. These disposal certificates must be signed by the Radiological Protection Supervisor before disposal. One copy of these certificates must be sent to the College RPO annually and one copy should be kept on departmental files

Waste containing a mixture of radionuclides in unsealed form shall be disposed of only if the sums of the ratios between either the total activity or the total activity concentration of each of the radionuclides and the corresponding limits listed in for which the sums of the ratios between either the quantity or the concentration of each of the radionuclides and the corresponding limits listed in Table A of S.I. 125 of 2000, is less than or equal to 1, for any day may be disposed of as non-radioactive or ordinary waste on that day.

Non-flammable water soluble waste may be disposed of down designated drains provided that the quantity or the concentration of each of the radionuclides is within the limits outlined in Table A of S.I. 125 of 2000. Such disposals must only be made via dedicated sinks or shores, which are directly connected to a municipal foul water sewer.

Flammable or non water soluble waste, such as certain scintillator fluids, must only be disposed of according to the agreed College procedures for the disposal of chemical waste. All such waste must be certified by the RPS before disposal and must comply with the parameters outlined in SI 125 of 2000. Disposal of such waste down the drains is strictly forbidden.

BIORESOURCES UNIT

Any proposal to undertake work with sources of ionising radiation in conjunction with the College Bioresources Unit, must receive the prior written approval of both the RPS in the Bioresources Unit and the College RPO. All such work proposals must include a written risk assessment outlining in detail the work to be undertaken, the procedures involved, and the protective and control measures that will be implemented on a step by step basis, right through to the final step of waste management and disposal. Where external bodies that are already licensed by the RPII, are involved in undertaking such work, this work will be undertaken under the control of their own Radiological Protection Officer and in accordance with their own individual licence conditions. They will merely be authorised to use our facilities subject to any conditions as may be specified, and with the prior approval of the RPS, the College RPO and the RPII. Such external bodies will be responsible for all aspects of the work undertaken, including the safe storage, removal and disposal of waste produced.

INSPECTION, AUDITING AND DISCIPLINARY ACTION

The College Radiological Protection Officer will inspect each department's records and facilities at intervals and will advise on any other precautions that may from time to time be required.

In the event of non-compliance with the safety rules relating to radiological protection, any individual / group may be reported to the College Radiological Safety Committee. The Committee may invoke disciplinary procedures which may include the suspension or cessation of work with ionising radiation.

All procedures involving the importation, transportation, custody and use of radionuclides and the disposal of associated waste are licensed by the Radiological Protection Institute of Ireland and these procedures are subject to their inspection. Licence applications are made by the Radiological Protection Supervisor, through the College Radiological Protection Officer, who submits them to the Radiological Protection Institute of Ireland for approval. The RPO will also periodically update the College Radiological Safety Committee and the College Safety Committee of ongoing amendments to the College RPII licence. Any areas of non-compliance with licence conditions will be rigorously investigated by the RPII who have the power to revoke or suspend the College licence. It is therefore imperative that these College Radiation Safety Procedures and the College RPII licence conditions are complied with.

(Amended and updated by the College RPO, Mr. Tom Merriman in Aug 2014)