



Safety Services

8. Laboratory Grading

8.1. Designation of Areas

Two types of radiation area are recognised by the Ionising Radiations Regulations, 1999:

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| controlled area | -where an employee is likely to receive doses of radiation in excess of 6 mSv in a year or where special procedures are required to restrict exposures to less than 6 mSv per year. |
| supervised area | -where an employee is likely to receive doses of radiation in excess of 1 mSv per year and/or conditions need to be kept under review to ensure that designation as a controlled area is not required. |

In addition to the above we also signify those low-level areas where an employee is unlikely to receive doses of radiation in excess of 1 mSv per year and we call these **'non-designated areas'**.

Working at the University you are unlikely to receive any significant dose of radiation in any laboratory, providing you follow the information and instructions that you are given. However, we are not allowed to designate all our laboratories as non-designated because the likelihood of receiving a dose of radiation is defined by a number of factors which are laid down in the Ionising Radiations Regulations. Bearing this fact in mind, we need to consider four distinct types of area when determining the grade of laboratory:-

1. Work where there is only an external hazard.
2. Work with X-ray equipment.
3. Work where there is only an internal hazard.
4. Work where there is both an internal and external hazard.

8.1.1 External Hazard only

A controlled area is required where the instantaneous dose is greater than $7.5 \mu\text{Svh}^{-1}$ to the whole body for more than 16 hours a week and greater than $75 \mu\text{Svh}^{-1}$ to the hands.

A supervised area is required where the instantaneous dose rate exceeds $2.5 \mu\text{Svh}^{-1}$ to the whole body and $25 \mu\text{Svh}^{-1}$ to the hands.

A non-designated area can be used where the instantaneous dose rates do not exceed $2.5 \mu\text{Svh}^{-1}$ to the body or $25 \mu\text{Svh}^{-1}$ to the hands and exposure times are limited to less than 8 hours a week at this exposure rate.

The above is a slight simplification, as one is allowed to use further time-averaging to allow higher dose rates than those stated for a supervised area. If this flexibility is required, then the Radiation Protection Adviser should be consulted.

8.1.2 X-ray Laboratories

A controlled area is required for X-ray work, when beam paths are not enclosed, or where the enclosure does not prevent access to areas where the dose rate exceeds the limits specified in para 8.1.1.

A supervised area is required when all beam paths are normally enclosed, but where some overriding of interlocks is required for alignment procedures, or where only the X-ray camera itself is providing the local enclosure.

A non-designated area can be used when a totally enclosed system is employed with no override provision on interlocks, such that it is not normally possible to gain access to dose rates in excess of $2.5 \mu\text{Svh}$

8.1.3 Internal Hazard only

One has to consider the need for a controlled or supervised area on the basis of a risk assessment.

The National Radiological Protection Board in Memorandum 443 (M443) looked at a variety of operational scenarios and exposure pathways to calculate the maximum quantity of different isotopes that could be handled in different grades of laboratory consistent with dose constraints of either 1mSv or 5mSv. They recommended that all areas where the dose constraint for the internal hazard is greater than 1mSv should be designated as controlled areas. A higher grade facility has a lower risk of inhalation/ingestion and contamination and therefore a larger quantity is permitted to be handled for the same dose constraint. Under this model the quantities permitted are large by university standards. It is therefore practical for us to work to a lower dose constraint that would also have the advantage of not requiring biological monitoring. It is recommended that we work to a dose constraint of

0.2mSv for the internal hazard using the NRPB model and this would permit the following quantities to be used in Grade 'C' and Grade 'B' laboratories:-

- Grade 'C' - non-volatile work.....up to 120 ALIs
- volatile in fume cupboard....up to 30 ALIs

- Grade 'B' - non-volatile work.....up to 1200 ALIs
- volatile in fume cupboard....up to 300 ALIs

Further information on this model and how it affects work with different radionuclides can be found at -

<http://safety.dept.shef.ac.uk/ir/prass.pdf>

8.1.4 Designation where there are both internal and external hazards

Where radionuclides present both an internal and an external hazard then a realistic assessment should be made of the likely doses that will result from the proposed work and every effort must be made to reduce these by the use of appropriate shielding. Working to an internal dose constraint of 0.2mSv, it will be the control of the external hazard, and whether special procedures are required to ensure this, that will determine the need, or otherwise, for a controlled area.

Further details are given in the [guidance notes](#) on individual isotopes found on this Web site.

8.2 Suitability of Laboratories

Permission will only be granted for work with ionising radiations if a suitable laboratory is available. This is particularly important for work with unsealed sources, for which special surface finishes may be required to the walls, floors and bench tops, and special facilities may be required for hand-washing, waste disposal and to guard against air contamination. Further information on the [design requirements](#) of laboratories for unsealed sources is available.

8.3 Access to Laboratories

Only those laboratories specified on the Work Certificates or Schemes of Work may be used for radioactive work up to the levels permitted therein. The entrance to all areas specified must bear the appropriate warning notice and, if required, a notice limiting access. Access to radiation areas is restricted as follows:-

- (a) **controlled areas** - restricted to classified radiation workers and others following a written system of work.

- (b) **supervised areas** - restricted to registered radiation workers and other persons whose presence, work or duties can be so controlled that they will not be exposed to significant amounts of radiation. The latter must be advised as to how they may fulfil this requirement.
- (c) **non-designated** areas no restriction on the grounds of radiation hazard.

8.3.1. Access to Service Personnel

Departmental staff must give special consideration to service personnel, who are unfamiliar with ionising radiation and the hazards involved.

When access is required to a controlled area by non-classified personnel who are not covered by a written system of work, then that area should be de-designated by the Departmental Radiation Protection Supervisor or another person who has the authority of the Head of Department, prior to entry being permitted.

Any person de-designating a laboratory should ensure that: the area has been monitored and found to be free from contamination; all sources of ionising radiations are either in store or shut down (X-rays and neutron generators); and nowhere in the area does the instantaneous dose-rate exceed $7.5\mu\text{Sv h}^{-1}$. They should then put a [de-designated notice](#) on the entrance to the laboratory and either hand to the service personnel or display on the door the clearance to work certificate (both these notices available from DRPS).

In other grades of laboratory, a similar procedure should be carried out to ensure that there is no hazard to service personnel. The de-designation notices, however, are not required, and verbal permission can be given. However, in some circumstances it may be worthwhile to use the de-designation notice so that all staff are aware that the area is not be used for work with ionising radiations whilst the service personnel are performing their tasks.

Before cleaning staff are allowed to start their duties, they must be told which areas have been monitored and cleared, and not to clean any other area. It may well be convenient for the cleaning staff to deal with the floor areas, and designated laboratory staff, bench tops and other surfaces. If this is the case, the cleaner must be instructed accordingly. Adequate instruction must be given over the segregation of radioactive and non-radioactive waste and the cleaner instructed not to deal with waste in the former category. If cleaning of glassware or other contaminated apparatus is necessary, steps must be taken to ensure there is no contamination hazard to the cleaning staff. See also the guide for [cleaning supervisors](#).

Each situation clearly presents its own particular problems and these cannot be dealt with adequately here. The Departmental Radiation Protection Supervisor should formulate plans, guided by the above, and seek the advice of Safety Services on any matters that are not clear.