RP CoP011: Controlled and Supervised Areas

1. Introduction

This Code of Practice gives advice on Controlled and Supervised Areas, their identification and their significance, and the preparation of designated-area notices. The term “designated area” is used in this Code of Practice to describe either a Controlled or a Supervised Area. Although the use of designated areas affects all radiation workers, this Code of Practice is intended predominantly for Radiation Protection Supervisors (RPS).

2. The Purpose of Designated Areas

Designated Areas are a legal requirement and the responsibility to designate is that of the employer. Their purpose is to help manage the radiation risk by identifying and segregating higher risk activities from the lower, and thus controlling the extent of radiation exposure. The higher category is the Controlled Area, and thus tighter controls will be required in Controlled Areas than in Supervised Areas. The following table gives some examples of the difference in control measures in between the types of areas:

Table 1: Examples of constraints in designated areas

Controlled Areas	Supervised Areas	Non-designated Areas
Access only permitted to classified workers or those entering in accordance with “suitable written arrangements”	Classification not required	Classification not required
Must be in a physically segregated area	Must be in a clearly demarcated area	No special segregation required
Restrictive controls on the access by non-radiation workers	Managed access by non-radiation workers permitted	No control on the access by non-radiation workers
Access by cleaners not permitted	Managed access permitted	Access permitted
Some form of personal monitoring mandatory	Personal monitoring only required in certain circumstances	Personal monitoring unlikely to be required

Controlled Areas	Supervised Areas	Non-designated Areas
Dedicated PPE required which must not be used elsewhere	PPE can be used elsewhere	PPE can be used elsewhere
Stringent contamination control procedures required	Normal laboratory contamination control procedures sufficient	Normal laboratory contamination control procedures sufficient
Local Rules always required	Local Rules sometimes required	Local Rules not required (although may be advisable)

"Suitable written arrangements" are a means to allow non-classified persons to enter and work within a controlled area. This might be necessary, for example, for the maintenance of facilities or equipment, intermittent work, or visitors. However, they must not in doing so receive a dose in excess of three-tenths of the maximum permissible annual dose. The arrangements are intended to prescribe the procedures that must take place to ensure this. It is normal for these written arrangements to be included in the Local Rules for the area. The University is required by law to demonstrate by personal monitoring or other suitable measurements that any non-classified persons entering controlled areas do not receive any dose in excess of three-tenths of the appropriate dose limit.

Work in a Controlled Area is at a higher risk than that in a Supervised Area, and work in a Supervised Area is at a higher risk than that in a non-designated area. Since persons should not be exposed to a greater risk than necessary, it follows that persons should not work in a higher category of radiation designated area than they need to. However, if a person begins work with an amount/concentration of radioactive material that requires a Controlled Area but reduces that amount/concentration as part of the experiment to below the limit for a Controlled Area, they do not have to change laboratories. They do however have to continue to work to the control measures appropriate to the Controlled Area.

Designated areas can be temporarily re-designated if it is convenient. For example, a laboratory normally designated as a Controlled Area might be needed to demonstrate some work with low levels of radioactivity to undergraduates. Provided all work requiring a Controlled Area status is ceased, contamination is removed, external radiation levels are appropriately low and warning signs are modified, then the laboratory could be used for the demonstration. **What must not occur is a mixture of work requiring different designated area status being undertaken at the same time (with the exception described in the preceding paragraph).**

The fact that an area is not designated does not preclude work with radiation. It does however mean that the work is deemed to be unlikely to give rise to a radiation

dose to any individual in excess of the annual radiation dose limit for members of the public. **Radiation work in a non-designated area still requires precautions appropriate to the risk, and it is essential that the presence of radiation and radioactive material is still rigorously indicated.**

3. Determining Designated Areas

The primary criterion for determining the boundaries of designated areas is the potential annual radiation dose (routine or accident) that could be received by persons entering these areas:

Controlled Area

An area where either persons might receive over three-tenths of the relevant annual dose limit, or "special procedures" have to be followed which are designed to restrict significant exposure, or to prevent or limit the probability or magnitude of radiation accidents (Note - special procedures are deemed to not include routine work with low levels of radionuclides).

Supervised Area

An area where either persons might receive more than one-tenth of the relevant annual dose limit, or the conditions of the area need to be kept under review to determine whether it could become a Controlled Area.

3.1 Designation Due to the Risk of Contamination

Where unsealed (open) radioactive material is being handled, the criterion for designating will normally be the extent of the risk of internal or external contamination. This section outlines the method of determining the appropriate designation of a lab used to handle such material**. It is very important to note that this method applies only to unsealed radioactive material used for the purposes of tracing or quantifying chemical or biological pathways or reactions, and in liquid form. If there is any possibility of significant airborne contamination, this method is not applicable and advice must be sought from the University Radiation Protection Adviser**.

STEP 1

Identify in Column 1 of Table 2 overleaf the relevant radionuclide and the corresponding value for that nuclide in column 3, "Limiting Concentration".

STEP 2

If the activity concentration of the radioactive liquid being handled (in $MBqml^{-1}$) is greater than or equal to the value in column 3, note the value in column 4, "Skin Limit" (Note - "handled" means just that; the activity value does not need to take into account the total amount of radioactive material being stored in the laboratory). If the amount of activity being handled in the laboratory is at or above this value, then the

laboratory must be a Controlled Area. If the activity concentration is less than the value in Column 3, note the value in column 2, "Ingestion Limit". If the activity being handled is at or above this value then the work must also be done in a Controlled Area. If the activity being handled is less than either of these values, proceed to Step 3.

STEP 3

Note the value in column 6, "Limiting Concentration". If the activity concentration of the radioactive liquid being handled is greater than or equal to this value, note the value in column 7, "Skin Limit". If the activity being handled is at or above the value in column 7, then the laboratory must be a Supervised Area. If the activity concentration is less than the limiting concentration, note the value in column 5, "Ingestion Limit". If the activity is at or above this value, then the Laboratory must be a Supervised Area.

STEP 4

If the actual activity being handled is less than either of these values, then the work can be done in a non-designated area.

STEP 5

Repeat the above process for each nuclide being used in the area. The designation must be chosen on the basis of the lowest value. No values are specified for storage. If the quantity of radioactive material being stored is sufficient as to give rise to significant external radiation levels, then the storage area should be shielded.

Table 2: Minimum Activity for Controlled and Supervised Areas

Isotope and chemical form	Controlled Areas			Supervised Areas		
	Ingestion Limit (MBq)	Limiting Concentration (MBq/ml)	Skin Limit (MBq)	Ingestion Limit (MBq)	Limiting Concentration (MBq/ml)	Skin Limit (MBq)
1	2	3	4	5	6	7
Tritium	5000	-	-	800	-	-
Carbon-14 (organic bound)	300	-	-	50	-	-
Sodium-24 *	500	0.5	1.0	80	0.15	0.3
Phosphorus-33	1000	5.0	9.0	150	1.5	3.0
Sulphur-35	300	-	-	50	-	-
Chlorine-36	200	1.0	1.0	40	0.3	1.0
Calcium-45	300	7.0	10	40	2.0	4.0
Chromium-51	5000	1200	2000	900	400	700
Cobalt-57	1000	450	700	150	-	-
Iron-59*	100	2.0	4.0	20	0.8	1.0
Zinc-65*	50	-	-	10	-	-

Isotope and chemical form	Controlled Areas			Supervised Areas		
	Ingestion Limit (MBq)	Limiting Concentration (MBq/ml)	Skin Limit (MBq)	Ingestion Limit (MBq)	Limiting Concentration (MBq/ml)	Skin Limit (MBq)
1	2	3	4	5	6	7
Selenium-75 (except elemental and selenides)	80	-	-	10	-	-
Phosphorus-32, Rubidium-86*	70	0.5	1.0	10	0.15	0.3
Technetium-99m*	10000	80	100	1500	25	50
Indium-111	700	10	15	100	3.0	6.0
Iodine-123	1000	30	50	150	10	15
Iodine-125, Iodine-131*	10	-	-	1.0	-	-
Thallium-201*	2000	80	150	350	25	50

3.2 Designation Due to the Risk of External Radiation

Although unlikely, there is the possibility that a laboratory (e.g. a tracer laboratory) may have to be designated due to the external radiation risk, or possibly due to a combination of the external and internal risk. In view of the difficulty in anticipating the contribution from external radiation to the designation of areas, personal monitoring might be required when using certain gamma or high-energy beta emitting isotopes. In Table 2 those nuclides marked with an asterisk (*) are significant gamma radiation emitters and the designation of the area may have to take into account the contribution due to external radiation. The need for personal monitoring is identified initially when a Radiation User Registration (RADUSER) Form is completed. The results of the monitoring can be used to confirm or re-assess the designation of the relevant area with the assistance of the University Radiation Protection Adviser (RPA).

The criteria for designation of areas used for sealed sources and x-ray generators (including adventitious radiation sources) will normally be the levels of accessible external radiation and the time of emission and/or exposure. Note that this could include levels accessible in case of reasonably foreseeable accidents. It is possible to designate an area temporarily, such as when a radiation source is revealed or switched on, but this is only practicable for relatively long exposure periods. It is not necessary to designate areas that cannot be physically entered however sample chambers, such as those protected by a single interlock, will likely require designation due to the dose rates inside the chamber. The University RPA should be contacted to help designate these types of areas.

4. Demarcation of Designated Areas

4.1 Controlled Areas

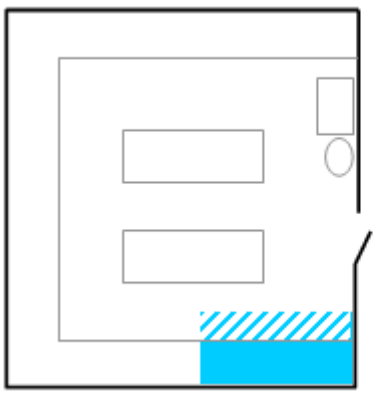
Once the boundaries of a Controlled Area are determined, they must be demarcated, segregated and displayed. A Controlled Area must be demarcated by physical boundaries; a line drawn on the floor is not good enough. It is thus normal for Controlled Areas to be in a separate room. In the case of unsealed radioactive material, anything inside the room is assumed to be potentially contaminated. In the case of closed sources and radiation generators, anywhere inside the room might have a radiation level high enough to give rise to a dose in excess of three-tenths of the maximum permissible annual dose.

The location of the Area must be described in the relevant Local Rules.

4.2 Supervised Areas

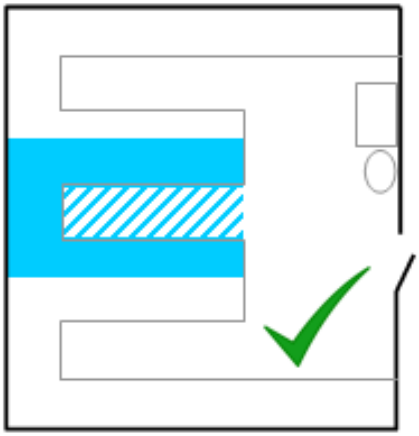
Once the boundaries of a Supervised Area are determined, they must be demarcated, but physical boundaries are not necessary. However, the boundaries of the area must be readily identifiable. In the case of unsealed radioactive material, anything inside the area is assumed to be potentially contaminated. In the case of closed sources and radiation generators, anywhere inside the area might have a radiation level high enough to give rise to a dose in excess of one-tenth of the maximum permissible annual dose.

In the case of areas designated as Supervised due to the internal radiation risk, it is common for them to be part of a larger laboratory. The choice of location within the laboratory is important to avoid increasing the risk of contamination and having to apply unnecessary restrictions to non-radiation workers. The following plans of benches in a theoretical laboratory give some examples of poor and good layouts. The solid colour represents the extent of the working area and the hatched colour the projected extent of the Supervised Area; it must be remembered that the actual Supervised Area extends to include any other part of the laboratory that might be contaminated, an obvious example being the floor area just below the lip of the bench.



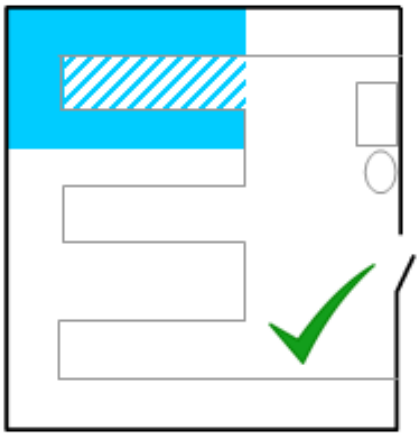
ACCEPTABLE

It is possible to exclude unauthorised persons from the Area, although difficult to demarcate it.



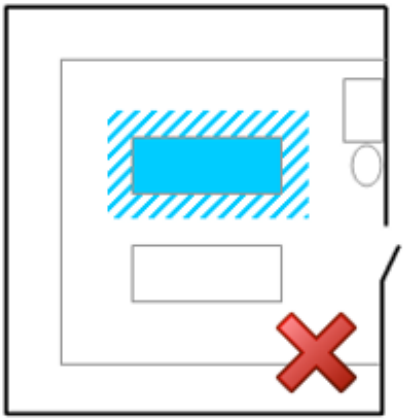
GOOD

It is possible to exclude unauthorised persons from the Area and easy to demarcate it. Separating barriers should be used along the central part of the benches.



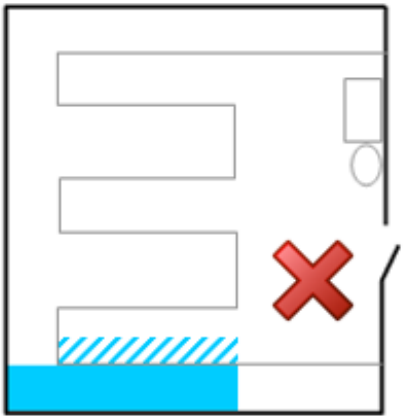
GOOD

It is possible to exclude unauthorised persons from the Area and easy to demarcate it. A separating barrier should be used along the central part of the bench.



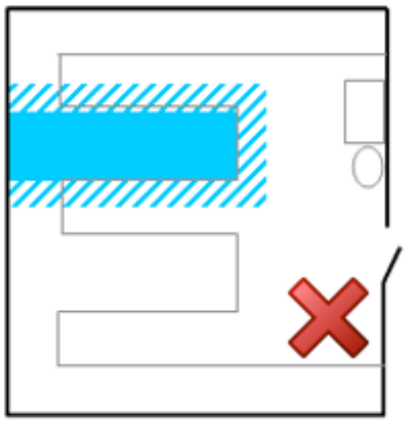
POOR

It is impracticable to segregate the area and prevent entry by persons not involved in the radiation work



POOR

It is difficult to exclude unauthorised persons from the Area and to demarcate it.



POOR

It is difficult to exclude unauthorised persons from the Area and to demarcate it.

There are various ways of demarcating the area. A physical barrier, such as a swing-arm or web/rope/chain barriers, is preferable. If the layout of the area makes this impracticable, an inferior but acceptable option would be a distinctive line on the laboratory floor.

The location of the Area must be described in the relevant Local Rules.

4.3 Non-designated Areas

Due to the low risk of the radiation work, non-designated areas do not need to be demarcated. However appropriate identification and warning of radiation sources and potentially contaminated surfaces is still essential. Using radioactive tape to seal down the edges of the Benchkote (or equivalent) would be a suitable way of marking the extent of the non-designated area.

5. Signage

See link for downloadable versions of signs:

https://health-safety.ed.ac.uk/radiation-protection/radiation-protection-management/signs

5.1 General

In order to ensure a consistent and readily identifiable approach to designated area demarcation, all such University areas must be labelled using a standard notice, following a format agreed by the University Radiation Protection Committee. Each notice must be clearly posted up at the entrance to its designated area. **Note that this means the entrance to the designated area**. It must not be put on the door, if different, to the laboratory, since the sign marks the point beyond which appropriate precautions need to be taken against the risk from radiation and radioactive material. All persons who pass the sign have to take those precautions.

5.2 Open Radioactive Material

Copies of the notices for work with open radioactive material are shown in Appendix 1. The notices actually serve a number of purposes. As well as identifying the type of area, they warn of the presence of radiation, describe the type, provide information about the RPS and the Area Radiation Supervisor, and indicate where a list of persons who are authorised to enter the area (in the case of Controlled Areas) or to work with the radiation sources (in the case of Supervised Areas) can be found. This list of authorised workers should be made separately, but displayed adjacent to the designated area notices. The use of a separate list will allow changes to be made to the names of authorised persons without having to alter the main notice.

5.3 Closed Radioactive Sources and Radiation Generators

The appropriate notices for designated areas arising from sealed sources or x-ray generators are shown in Appendix 2. If any designated area is confined to within a piece of equipment, and it is not physically possible to enter this area, then it does

not need to be designated. **However, warning signs to indicate the presence of harmful levels within the equipment would still be necessary.**

5.4 Unsealed Radioactive Material Radioactive Material – Additional Information

In the case of work with unsealed radioactive material the notices serve one other purpose. They provide information about the quantity of radioactive material that might be found in the area, and the maximum amount permitted to be present in any area.

Restrictions are imposed upon the amount of radioactive material in any particular area for two reasons.

1. The first concerns safety. By restricting the amount of radioactivity to designated types of areas a match can be made of the appropriate control measures to the extent of the risk. Thus, very small quantities of radioactivity can be handled in an undesignated area, work with quantities of radioactivity below a certain level must be carried out in a Supervised Area, work with quantities above this level in a Controlled Area, and very large quantities (which are unlikely to be handled in the University) would require extra precautions within the Controlled Area.
2. The second concerns ensuring that the University works within the limits in its Environmental Authorisations (Scotland) Regulations 2018 (EASR) Permit. If it is left to each section or group within the Permitted premises to control the amount of radioactive material it acquires, then the quantity of radioactivity specified in the Permit has to be divided and allocated to each section. Where there are a number of laboratories in each section/group, the allocated quantity of radioactivity may be further divided into each of the laboratories.

In order to help monitor this allocation arrangement, each Controlled and Supervised Area notice for unsealed radioactive material work contains a table as shown below. The table is completed by the Radiation Protection Supervisor.

Table 3: Copy of the table displayed on Controlled and Supervised Area notices in laboratories using unsealed radioactive material

Maximum Permitted Activities		
Isotope	**In Use (MBq)**	**In Storage (MBq)**

Column 1 is for stating the isotopes being used in the designated area, and must be completed.

Column 2 states the **maximum** activity likely to be used in the designated area for the corresponding isotope in column 1. It must be completed. The maximum activity is mainly determined by the nature of the work that is being undertaken, but with one constraint – the limits in between controlled, supervised and non-designated areas. “Used” means manipulated, rather than just stored, so that if an aliquot of radioactive material is removed from a stock solution, the amount of activity being “used” is the activity of the stock solution. It is therefore possible to have more activity in an area than is being used, the latter being determined by the activity of the highest-activity stock solution.

Column 3 states the maximum activity of stock radioactive material that may be stored in the area. This column is intended to help limit the amount of radioactivity on the premises to within the SEPA allocation. It need not be completed if the RPS is confident that there is adequate control of the amount of radioactivity on the premises by other means. Where an area is used for the withdrawal of aliquots from stock solutions kept in that area, the values in columns 2 and 3 will normally be the same. Where an area is used to manipulate radioactive material but the material is drawn from stock elsewhere, the values in column 3 will be zero. It is possible, although unusual, for the values in column 2 to exceed those in column 3, such as when radioactive material is brought into an area already holding stock solutions to make use of specialist equipment.

The sum of the values in column 3 for each designated area used for storage should equal the allocation of radioactivity for the department. Note that all activity values should be in megabecquerels.

For advice on any of the above topics please contact the Radiation Protection Unit.

Appendix 1: Controlled and Supervised Area Notices For Unsealed Laboratory Work

RADIATION CONTROLLED AREA

RISK OF RADIATION AND CONTAMINATION

NO ENTRY EXCEPT AUTHORISED PERSONS

DEPARTMENT	:	
RADIATION PROTECTION SUPERVISOR	:	
AREA/DEPUTY RPS	:	
ROOM NUMBER	:	
TYPE OF RADIATION SOURCE	:	Unsealed Radioactive Material

MAXIMUM TYPICAL ACTIVITIES IN USE & IN STOCK		
Isotope	*In Use (MBq)*	*In Stock (MBq)*

ACCESS IS RESTRICTED TO THE AUTHORISED RADIATION WORKERS LISTED ON THE ACCOMPANYING NOTICE. ANY OTHER PERSON WHO REQUIRES ACCESS MUST HAVE THE PERMISSION OF THE RADIATION PROTECTION SUPERVISOR.

Radiation & Contamination Controlled Area notice October 2013

(Note: Yellow background required for Controlled Area notices).

RADIATION SUPERVISED AREA

RISK OF RADIATION AND CONTAMINATION

NO ENTRY EXCEPT AUTHORISED PERSONS

DEPARTMENT	:	
RADIATION PROTECTION SUPERVISOR	:	
AREA RADIATION SUPERVISOR	:	
ROOM NUMBER	:	
TYPE OF RADIATION SOURCE	:	Unsealed Radioactive Material

MAXIMUM TYPICAL ACTIVITIES IN USE & IN STOCK		
Isotope	*In Use (MBq)*	*In Stock (MBq)*

THE PERSONS AUTHORISED TO WORK WITH THIS RADIOACTIVE MATERIAL ARE LISTED ON THE ACCOMPANYING NOTICE.

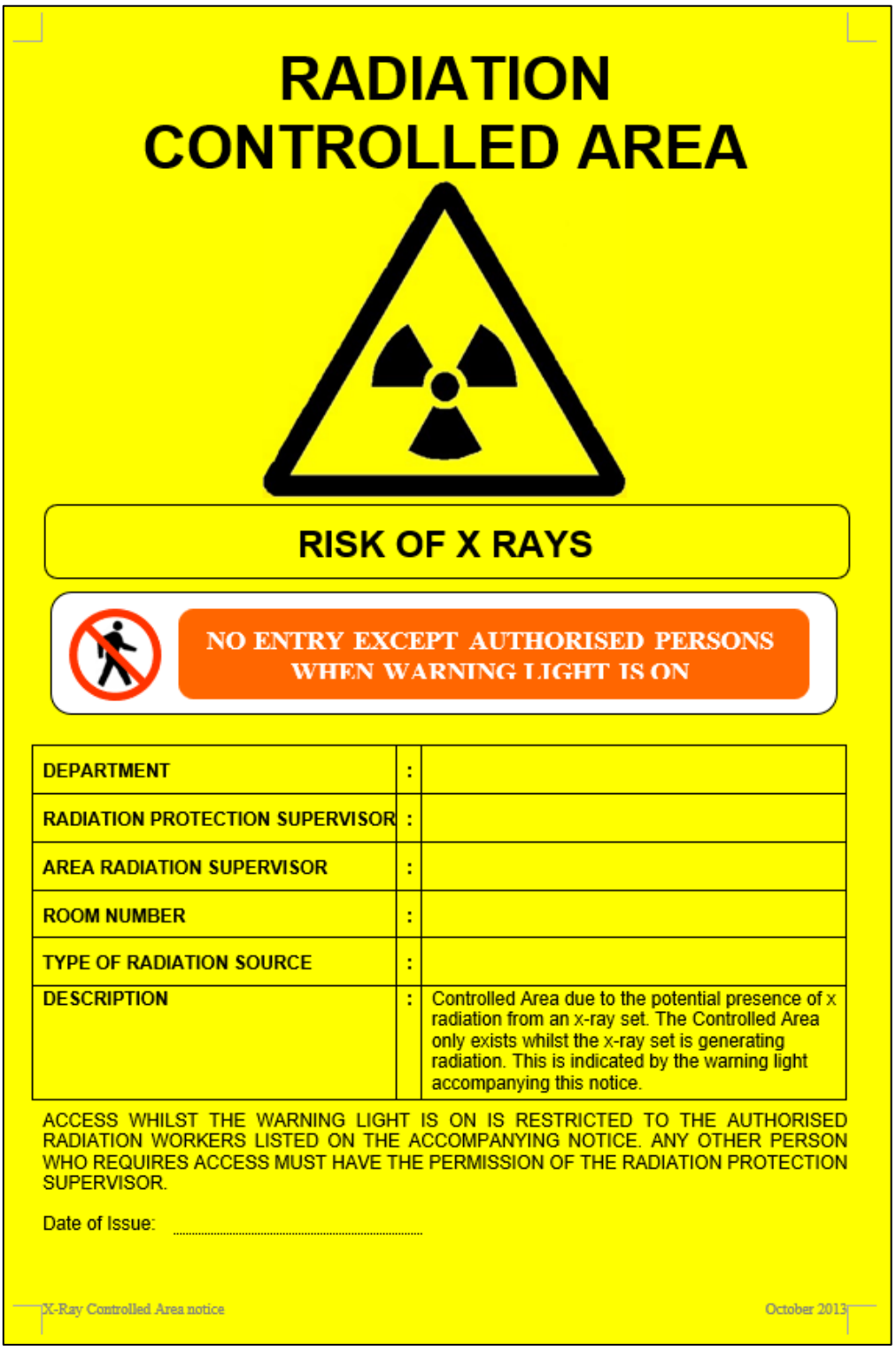
Date of Issue: .....

Radiation & Contamination SUPERVISED Area notice October 2013

(Note: White background required for Supervised Area notices).

Appendix 2

Controlled and Supervised Area Notices for Sealed Sources and X-Ray Generators



RADIATION CONTROLLED AREA

RISK OF X RAYS

NO ENTRY EXCEPT AUTHORISED PERSONS WHEN WARNING LIGHT IS ON

DEPARTMENT	:	
RADIATION PROTECTION SUPERVISOR	:	
AREA RADIATION SUPERVISOR	:	
ROOM NUMBER	:	
TYPE OF RADIATION SOURCE	:	
DESCRIPTION	:	Controlled Area due to the potential presence of x radiation from an x-ray set. The Controlled Area only exists whilst the x-ray set is generating radiation. This is indicated by the warning light accompanying this notice.

ACCESS WHILST THE WARNING LIGHT IS ON IS RESTRICTED TO THE AUTHORISED RADIATION WORKERS LISTED ON THE ACCOMPANYING NOTICE. ANY OTHER PERSON WHO REQUIRES ACCESS MUST HAVE THE PERMISSION OF THE RADIATION PROTECTION SUPERVISOR.

Date of Issue: .....

X-Ray Controlled Area notice October 2013

(Note: Yellow background required for Controlled Area notices).

RADIATION SUPERVISED AREA

RISK OF RADIATION

NO ENTRY EXCEPT AUTHORISED PERSONS

DEPARTMENT	:	
RADIATION PROTECTION SUPERVISOR	:	
AREA RADIATION SUPERVISOR	:	
ROOM NUMBER	:	
TYPE OF RADIATION SOURCE	:	
DESCRIPTION OF SOURCE(S) OF IONISING RADIATION	:	

THE PERSONS AUTHORISED TO WORK WITH THE RADIATION SOURCE(S) IS/ARE LISTED ON THE ACCOMPANYING NOTICE.

Date of Issue: .....

Radiation SUPERVISED Area notice October 2013

(Note: White background required for Supervised Area notices).

Document version

Version number	Summary of change	Date and by whom
V1.0	New version	March 2007 Colin Farmery
V1.1	Minor updates	October 2020 LW
V1.2	New template, minor updates	February 2025 Mark Green

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