

Source Identification Labels

A package containing any but the weakest radioactive source bears an adhesive label which shows, under the warning trefoil, the kind of radiation emitted.



Radiation Areas

Radiation Areas contain sources of external radiation: accelerating machines and the like (which can be switched off) and sealed radioactive sources (which cannot). The degree of radiation that may exist is indicated by the coloured roundel on the right-hand side of the label at the entrance to a radiation area. The colour code for the roundels is as follows:



Contamination Areas

Contamination Areas are those in which there is a risk of radioactive dust or fumes or other material. Every precaution is taken to stop any radioactive dust or material from getting into the laboratory but nevertheless traces may escape. An important object of the control measures is to make sure that no contamination is taken outside the area, for example on a visitor's hands or on his clothes. Considerable trouble may be caused if contamination is taken outside. If it is inside you, however, you can't get away from it; you have to take it with you. Never smoke, eat, or make up in a contamination area. The degree of contamination risk is indicated by the roundel on the left-hand side of the warning label at the entrance to the area. Like this:

Safe FROM RADIATION

Emergency Alarms



In every industry there is the possibility of various kinds of accident that might affect many people. In the atomic energy industry some of these may involve radiation. Special plans exist at Harwell for dealing with such accidents and special alarms would be sounded in the event of such accidents. These are the emergency alarms which you should learn to recognise.

Urgent evacuation

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Site emergency Mixtoms

The second kind of alarm is used for an accident in which active material is released so that a cloud, which may be invisible, of radioactive dust or vapour might drift across the site. This might happen if there were a fire in a store which might cause a leak, or if a container were damaged. In such cases, the alarm is sounded, on the Mixtoms around the site. Should this alarm sound, go at once inside the nearest building or if indoors stay there, and shut all windows and doors. Report to the building warden who will tell you if there are any other instructions. Do not use the telephone if there is an alarm; all the lines must be kept clear for emergency traffic.

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A PURPLE (4) roundel means no entry: the level of radiation is very high and special precautions are necessary.

A RED (3) roundel means that, though it is safe to work in the area, continual care is necessary. A visitor must get a film badge from the local Health Physics Office; this will be used to check that no excessive dose has been received.

A BLUE (2) roundel means that no special precautions have to be made to control external radiation. A visitor need not wear a film badge though some-one working in the area must do so.

A WHITE (1) roundel means that no special precautions are necessary.

Sometimes the coloured roundels are crossed by diagonal lines. This indicates a **TEMPORARY INTERMITTENT RADIATION AREA**, that is one in which the source of radiation can be switched off or readily removed; when either is done the area becomes temporarily a White Area.



A PURPLE (4) roundel means, as in a radiation area, no entry. There is likely to be contamination in the air and on surfaces and therefore special protective suits and breathing apparatus must be worn.

A RED (3) roundel means that, though it is safe to work in the area, constant care is necessary. A visitor must wear at least a laboratory coat and canvas overshoes to prevent contamination of his own clothes. On leaving the area the coat and shoes must be checked in a monitor, to make sure that there is no radioactivity on them. Smoking, eating, and making up are not allowed. It may be necessary to wear a film badge.

A BLUE (2) roundel means that no special precautions have to be taken unless the Area Supervisor decides that some protective clothing is desirable. A Blue Area is often one in which the only chance of contamination is from material spread from a neighbouring Red Area.

A WHITE (1) roundel means that there is no chance of contamination of the area. Since radioactivity cannot be switched off there is no such thing as an intermittent contamination area; there are therefore no striped patches on the left-hand side of warning notices.

Sometimes the coloured roundels are crossed by diagonal lines. This indicates a **TEMPORARY INTERMITTENT RADIATION AREA**, that is one in which the source of radiation can be switched off or readily removed; when either is done the area becomes temporarily a White Area.



WHAT IS RADIATION?

Light and heat are radiations that we all know about because we can see or feel them. Most of us don't know about ionising radiations because they can't be seen or felt. All the same, they are there, as widespread and common as light. We live in a sea of ionising radiations that pour in from outer space or from the rocks and soil under our feet.

This natural background of ionising radiation does not reassure us much because the amount of dose that a person gets in a lifetime is too small. Much larger doses of ionising radiation may be given by doctors the form of x-rays to diagnose injury or to treat some diseases. Similarly ionising radiations are used in atomic energy operations. These radiations are prevented from harming workers and the public by a variety of measures. By making sure that the dose to any person is very small, we are safe. This dose is known as the **MAXIMUM PERMISSIBLE DOSE**. It has been carefully defined by the International Commission on Radiological Protection and the Medical Research Council (which is the British authority) at so low a value that it will cause no detectable effect on the body during a person's lifetime. A dose of radiation may be built up quickly or spread over a long period, as it is with background radiation. Within limits doses can be averaged so that no harm is done if a large dose is received through working in strong radiation for a short time, provided the worker then stays away from radiation for a few weeks thereafter.

To ensure that one gets more than the maximum permissible dose, proper control of radiation is needed. At Harwell control measures are laid down in the radiation-safety regulations, which must be obeyed. You must play your part.

Because your eyes or ears don't tell you when there is radiation about, the health physics people provide special instruments that will do so and that will measure the amount present. These instruments are your extra, radiation-sensitive, eyes. Don't ignore them.

Kinds of Radiation

Radiation may be encountered in an atomic energy establishment in two different forms, external and internal. External radiation comes from sources outside you; you can get away from the sources and so avoid the radiation. Internal radiation comes from radioactive material that has got inside you somehow; you are therefore forced to carry it with you.

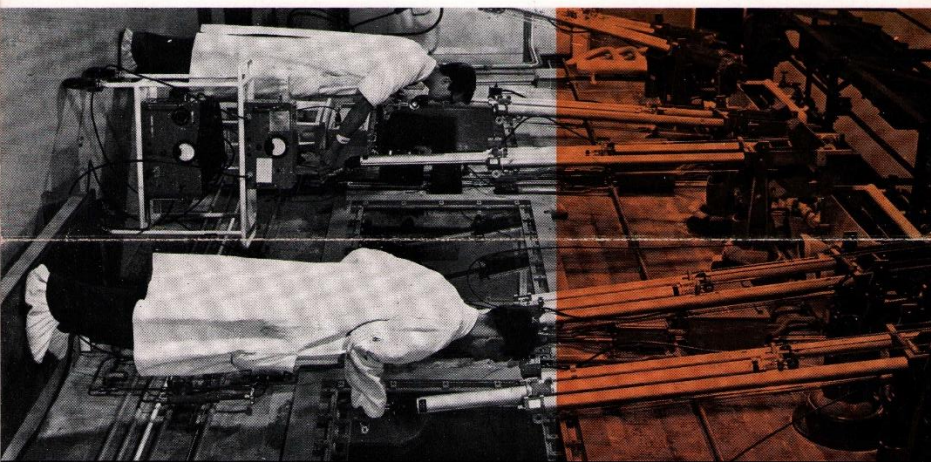
External Radiation

External radiation, like the natural background radiation and like x-rays, penetrates your body to a greater or lesser extent. It is produced by active isotopes. Machines can be switched off; the radiation then stops. Radioactive isotopes cannot be switched off; they have to be surrounded by a shield. This shield is made of lead or concrete. If a radiation is not very penetrating and can be stopped by a thin shield of perspex or aluminium, other radiation is much more penetrating and a thick shield of lead or concrete is needed to stop it. Shields are also put round machines to absorb the radiation produced when they are operating. Health physicists use special instruments to check that the radiation level is kept below the permitted amount. The amount of radiation that you can receive from an external source decreases quickly as you go away from the source. Distance is therefore a good protector.

Internal Radiation

If you accidentally breathed in some radioactive dust, or ate some, or picked some up on your hands, you would have internal radiation. The source of radiation actually inside you. Even the less penetrating radiation would then affect your tissues. Obviously, therefore, the possibility that radioactive material might get inside you must be guarded against. This kind must be made extremely small.

Radioactive dust or fumes may be released in some chemical or metallurgical operations; these are controlled by special measures. Machines are equipped to protect workers from contaminating material. Radioactive contamination would follow if active liquid were spilt in an experiment or if the container was broken. If this happened, the material would be accidentally broken and some of the material escaped. Great care is taken to prevent spills of this sort.



RADIATION CONTROL AND SAFETY

The basic protective measure at Harwell is to treat all areas where radiation of any kind may be found as special areas and to control operations within them carefully. Except when being taken from one place to another, sources of radiation are not allowed in any other part of the Establishment so that all the rest is entirely free from radiation (apart from the natural background) and you are as safe in it as in any other part of the country. Occasionally, for example if a radioactive source leaked from its container whilst being moved about the site, a temporary controlled area would be marked out (by ropes or other barriers) in a part of the site that is normally uncontrolled. Within Controlled Areas precautions, most of them quite simple, are taken to protect workers and visitors. Overall safety (including safety from ordinary accidents) of each Controlled Area is the responsibility of an Area Supervisor; on radiation safety the Area Supervisor is helped and advised by the staff of the local Health Physics Office. Since radiation can be encountered in two different forms, there are naturally two kinds of Controlled Areas. These are called Radiation Areas and Contamination Areas. Each has its own methods of control. Sometimes both forms exist in a single area, then both methods of control are applied.

These men are working with radioactive materials in shielded cells using remote-handling manipulators.

Labels

Both kinds of Controlled Area are labelled to indicate what may be found in them. These labels are the equivalents of **SLOW** or **HALT** signs by the roadside. Learn to recognise them and to take heed automatically of what they say.

All doors leading to Controlled Areas carry the black-on-yellow tiddler that indicates radiation, framed on each side by a coloured and numbered vertical bar. The bar indicates the degree of radiation or contamination to be expected in the next page for the meanings of the different colours.

Where the level of radiation or contamination is so high that special precautions are necessary, the sign bears the words **NO ENTRY** and one or both roundels are **PURPLE** (4).

All other labels bear the words **UNAUTHORISED ENTRY PROHIBITED** and have **RED** (3), **BLUE** (2), or **WHITE** (1) roundels.

Below the roundels are panels giving the local Health Physics Office and the name of the Area Supervisor.

Monitors

The instruments used to check whether radiation is to make sure that shields around radioactive materials, and other sources of radiation, are effective. Radioactive contamination is indicated by the radiation given off, even by minute traces of contamination. Geiger-Müller counters and monitors are used to measure radioactivity in the air, on surfaces, on instruments, and on clothes.

This man is monitoring his hands for contamination after working in a Controlled Area.

